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Forces Driving Leadership through Quality

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ABSTRACT

All too often we lose historical perspective on the knowledge that has been developed by mankind and we resort to seeking new solutions by the method of “reinvention” – forgetting what is old and important that has been discovered. Such is the case in the job of leaders as they seek to manage the quality that is produced by their organizations. This paper begins by setting an historical perspective and then develops a general model for the development and delivery of quality. It provides a launching pad for further investigations of the elements of compliance, competence development and innovation that are a framework for excellence which support a theory of profound knowledge that integrates systems perspectives with its process emphasis, statistical engineering and the study of variation, in the pursuit of knowledge that is applicable in the activities of humans. In this framework, called leadership through quality, it is the job or obligation of leaders to deliver performance in the short-term (so-called managing for results) while exercising self-control to assure strength in the long-term. These themes will be initially developed in the current paper and then further expounded upon in subsequent papers. We will begin this thinking journey with a discussion about the nature of quality.

Keywords: Quality Management, Theory of Attractive Quality, Kano Model, Noriaki Kano, Continual Improvement, Competence Development, Compliance, Innovation, Total Quality Management (TQM), Profit Impact of Market Strategy (PIMS), Quality Delivery Model

Prelude: The Quality Perspective in Consumer Choice

Organizations market their unique technology (products and services) to potential customers at an economic price. However, customers are convinced or motivated to acquire what the philosopher Alfred North Whitehead (1861-1947) in his 1929 book *Process and Reality* called an

“actual entity”, a bundling of the products and services based on its perceived value, both economic and psychological. This idea was initially proposed in the appendix to his 1931 book, ***The Economic Control of Quality of Manufactured Product*** by Walter A. Shewhart (1891-1967). However, customers make a choice for an acquisition from among alternative “entities” based on their perception of a proposition for value which can be described by Frederick I. Herzberg’s (1923-2000) Hygiene-Motivator (H-M) theory in which the hygiene factors are dissatisfiers and motivators are satisfiers (described in his 1959 book ***The Motivation to Work***) and Abraham H. Maslow’s (1909-1970) Hierarchy of Needs where humans prioritize their search for satisfaction (established in his 1954 book ***Motivation and Personality***). The economic basis for considering this dynamic was established by Austrian School economist and philosopher Ludwig von Mises (1881-1973) who believed that “the history of mankind is the history of ideas.” Von Mises had described his approach to the field of social sciences study as “praxeology,” or the study of human choice and decision-making. Von Mises distinguished between government-controlled economies and free market economies where economic decisions are based on the principles of behavioral psychology and human choice in his 1940 book ***Human Action: A Treatise on Economics***. Von Mises’ libertine ideas formed a basis for modern study of behavioral economics. Thus, quality has an important role in the personal acquisition process that underlies human choice and action. Things acquired are not merely the “actual entity” described by Whitehead but are the “perceived entities” of von Mises, and the value that consumers perceive is derived from the relative standard in which a choice is made based upon qualities under comparison. In other words, the value that forms the basis of consumer perception is not its pure monetary value but is also influenced by psychological value formed by subjective understanding.¹

The Significance of Quality

Organizations respond to these circumstances by creating a strategy to optimize “competitive differentiation” in the consumer’s perception as compared to the alternatives available for their consideration. How well organizations perform in this competitive market is a function of the “perceived value” they are able to create in the minds of potential customers and this insight is built on relative value of qualities in the marketable entity as perceived in the customer’s mind.

Organizations seek to obtain and maintain a differentiated leadership position in the perception of their distinctive market within their industry. This describes is the essential nature of business competition. While having the right product at the right price and the right time is important to succeed in business, real winners know that the definition of “right” has a strong component of quality. In fact, organizations have created business leadership through development of sound practices for business and operational quality which increase their customer-perceived position.

In a study conducted at the Wharton Graduate School of Business for General Electric, a strong relationship was observed between the relative market share held by an organization and the relative customer-perceived quality (in comparison to its peer group) with the profitability of organizations (measured using return on investment). Figure 1 below evaluates head-to-head peer performance between organizations with similar strategies and sorts their performance for these three characteristics. It is clear that winning performance is assured by building market share and increasing customer satisfaction beyond the performance of competitors. Thus, the

¹ This prelude is an incomplete description of the philosophical and psychological foundations of modern quality management and needs to be further developed in a subsequent paper.

imperative to assure quality must be a key ingredient in the leadership strategy of organizations that seek to develop their market penetration. But, what does it mean to pursue quality?

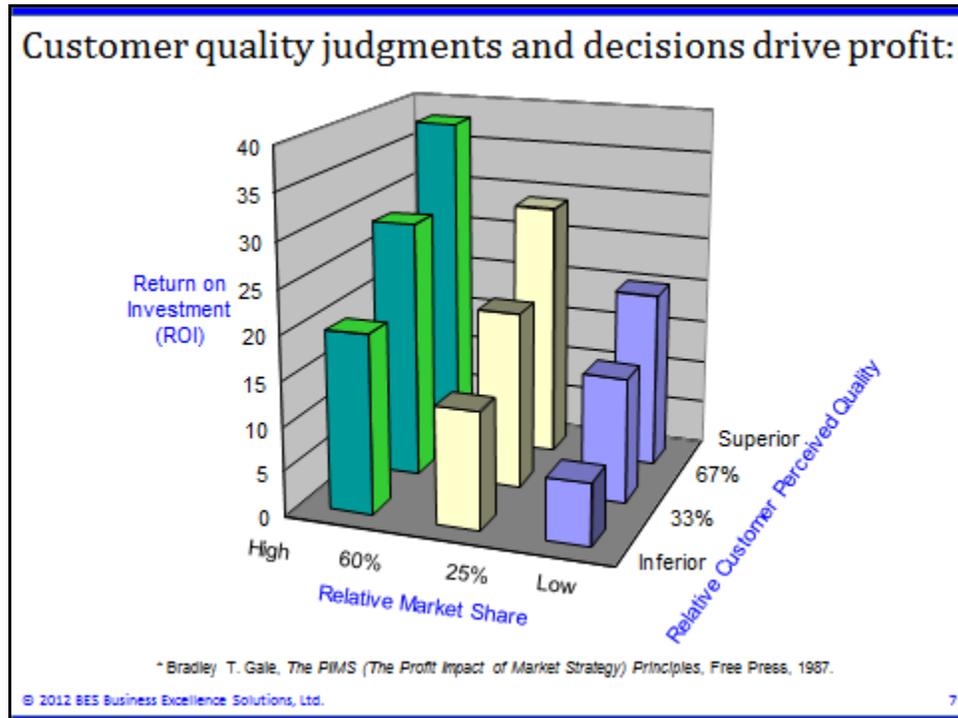


Figure 1: The Profit Impact of Market Strategy Study Results

The Nature of Quality

In order to apply quality as an implement of management, it is essential to understand both what it is and how it can be generated within an organization. For quality to be developed into a competitive advantage of an organization management must first decide what they mean by quality and then chose a pathway for delivering quality into the outcomes that the organization produces for its customers and shareholders. Quality must be expressly embedded into the daily experience of managing an organization in both dimensions of designing the quality “actual entity” (product) or “experience” (service).

One way to understand how quality is assured in organizational outputs is through examination of the Quality Delivery Model. This model describes a three-step process which delivers quality to the beneficiaries and evaluators of its value. As is shown below in Figure 2, these three steps are: determine what the customer wants; develop a promise of results or outcome generated; and deliver the outcome. What occurs in these three steps?

- **What the customer wants:** this process develops an imaginative understanding of a quality deliverable (either actual entity or experience) based on an investigation of attributes of the deliverable that will meet the customer’s performance expectation. Three levels of quality expectation should be addressed: first, compliance quality for basic or foundational needs that are judged relative to a standard for performance; second, the competitive

quality of attributes that must exceed the value proposition of alternative choices that are available to the customer; and third, attractive quality attributes that provide unanticipated delight to the customer through the development of an innovative capability. However, innovations of this type are dynamic and have a half-life of degradation to the competitive level as free market conditions cause competitors to duplicate functionality and the advantage of being the prime mover for developing a novel feature or functional attribute becomes nullified in time. In this activity, any gap in quality is a loss caused by design and the methodology that is able to address such losses is reliability engineering (typically embedded in a Design for Six Sigma (DFSS) process). However, not all customer expectations must be met as the organization has to evaluate its commercial goals against the ability to engineer a product that will satisfy the critical requirements of its customers.

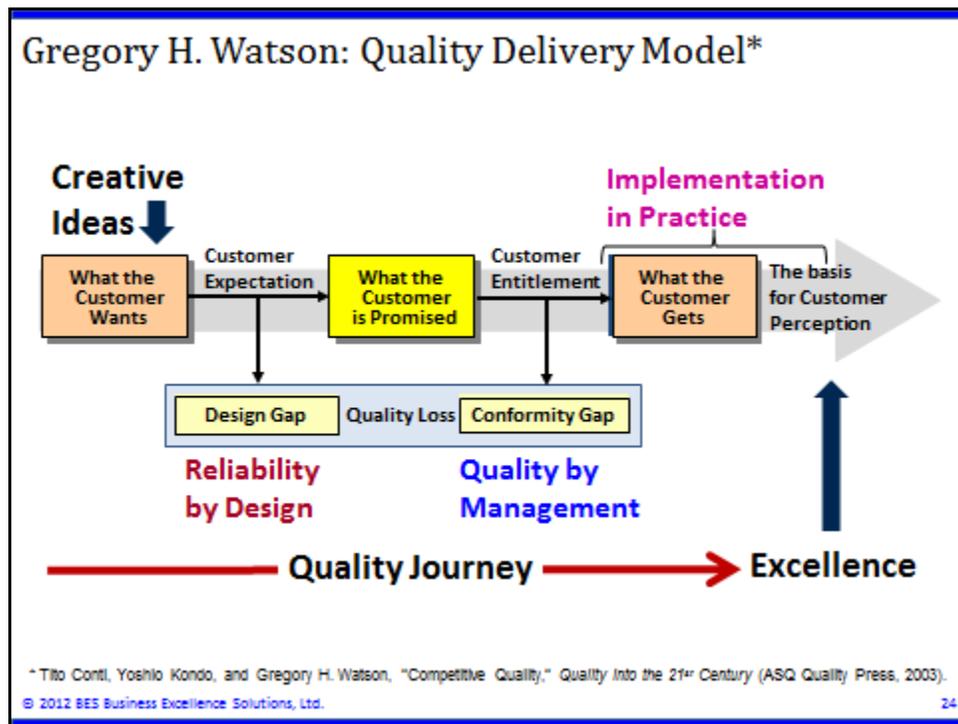


Figure 2: Quality Delivery Model

- **What the customer is promised:** The design process is completed by making a performance promise to customers that defines what they should expect to achieve in the performance envelope of the product or service attributes. The objective of promise-making is also to be promise-keeping. Thus, the objective of the promise should be flawless execution from the viewpoint of the customer (performance that is perceived to be so good that customers do not have any experiences which they would consider flawed with respect to the agreed upon requirements for performance). The execution of the work (management of the daily work that delivers outcomes to customers) is evaluated during the third step in the quality delivery process.
- **What the customer gets:** People learn about quality by observation of the performance of an "actual entity" or "experience" that they receive. Thus, customer perception is based on an assessment of what they get. If customers perceive that the design is insufficient or that

a product or service does not live up to its performance promise (the expectation that has been set in the promise), then they would judge a product or service as lacking in quality. In making such a value judgment, there are two different new aspects of failure: (1) problems that develop in the management of the process of realizing the service before delivery to a customer, and (2) problems that develop in the customer's implementation or experience in using the product or executing the service. In either case, shortfalls from the promise will be typically evaluated as a "lack of quality" by the customer.

Since this process develops content of products and services using the process of management, it will result in continual improvement and refinement of products and services as they seek to increase the alignment of its "value proposition" that best fits their customer's expectations. In achieving this alignment, the front-end of the process must develop an imaginative way of seeing a customer's application or "job that needs to be done" as articulated by Clayton M. Christensen 2003 book *The Innovator's Solution*. Thus, creative ideas drive the quality delivery process and as the cycles of improvement continue, this process is actually a journey that delivers excellence: value that customers use and appreciate. Thus, it is possible to conclude: excellence is a milestone on the quality journey. As customers intensify their requirements and set higher expectations, the required level of excellence will also continue to increase. This process for quality delivery aligns with the theory of attractive quality (as defined by Noriaki Kano).

Positioning the Theory of Attractive Quality

Japanese professor Noriaki Kano provided the through leadership that in 1984 created The Theory of Attractive Quality, whose graphical expression is typically called "the Kano model," and which traces its intellectual roots to the Japanese research into Western theories of human motivation as promoted by Herzberg and Maslow (see further Yoshio Kondo's (1924-2011) report published in 1989 to present research findings of the Japanese Standards Association (JSA) Research Committee, titled *Human Motivation: A Key Factor for Management*). The third psychologist who influenced Japanese thinking on motivation was Douglas M. McGregor (1906-1964) and his 1960 book *The Human Side of Enterprise* was highly influential. The principal literature of these psychologists (Herzberg, McGregor, and Maslow) was translated by Japanese businesses in the period of 1960-1970 to better understand how to compete against the foreign business environment of the Western world. Kano recognized that the human perception of value was important: "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." Kano's observation led to his 1984 description of the Theory of Attractive Quality. Over the past decades this theory has gained increasing exposure and has attained general acceptance as a central tenant in the body of quality knowledge. The rest of this paper will describe the Kano Theory of Attractive Quality, interpret Kano's theory regarding business issues concerning customer satisfaction, propose extensions of this theory to related business issues, and describe basic consumer perceptions about quality using its framework.

Kano's theory will also be applied strategic business planning and to requirements analysis of the relative merits of proposed marketing features in the new product development process. In addition the Kano Model will be related to the value disciplines that organizations can pursue as means to obtain market differentiation (operations excellence, customer intimacy and product

leadership) and as a mechanism for specifying quality strategies that support these disciplines (compliance, improvement and excellence). Finally, the model can be used to describe what is the relative importance of business improvement initiatives that focus on innovation, customer insight and competence development as drivers of competitiveness. In summary, Kano's Model will be used to describe those forces that create business leadership through a focus on quality to establish customer-perceivable distinctions in the competitive market.

The Nature of Competition under the Kano Model

The objective of business performance is sustainable competitive advantage. This means that a company is delivering profit in the short term (thereby satisfying investors) and strength in the long run (thereby providing a secure working environment for employees) while simultaneously delivering excellence in its products and services (thereby satisfying customers).

The business challenge for any company is to obtain and retain customers, while concurrently growing new market. "Competitive excellence" is achieved when a company has the ability to grow sales revenue through both increasing transactions with current customers (growing "product share" within their customer base) and by extending offerings to additional customers (growing its "share of the market" by attracting new customers). A firm's profitability may be assured by a concurrent focus on decreasing the cost to delivery products and services and simultaneously growing the number of customer sales transactions. This approach to business competitiveness is based on the theory of transactions costs developed by Nobel Prize recipient and economist Ronald H. Coase in a collection of his papers published in 1988 as ***The Firm, The Market, and The Law*** (transaction costing is an intellectual precursor to activity-based costing).

Since a share in competitive markets is captured at the expense of adversaries, the winner must be able to provide a perceivably superior product or service and subsequently be able to sustain that performance perception as its customers continue to experience the product or service throughout its life cycle. In other words, the ability to sustain "performance" over time is more valuable to a company than its ability to "inform" or advertise at a point in time. As practiced at companies, this type of innovation requires a constant delivery of excellence in each customer's experience with the actual entity delivered to the market by the participating organization.

Joseph A. Schumpeter (1883-1950), an Austrian economist belonging to the school of Von Mises, introduced (in his 1950 book ***Capitalism, Socialism and Democracy***) the idea that innovation requires planned abandonment and creative destruction of the established, familiar, and customary or comfortable ways of working ... in products or in services, competencies and human relationships to maintain competitiveness. This definition of innovation is called "creative destruction." By planning to rapidly replace your own products or services in the market, organizations preempt the ability of competitors to gain advantage. In some high technology companies this market tactic is applied with such vengeance that the practice has taken on a cannibal-like descriptions: "you've got to learn to eat your young." The practice of continuous innovation places some special requirements on an organization's ability to study, interpret and meet the needs of consumers. In such a rapidly moving environment, the consumer does not always know what they need or what benefits could be brought to them with a new generation of technology. As the late W. Edward Deming (1900-1993) once quipped: "The customer never asked Mr. Edison for a light bulb." Thus, the burden for identifying features and functions that deliver attractive quality is on the producer, not on the consumer.

This way of looking at the competitive dynamics of a market underlies the application of the Kano Model.

Understanding the Theory of Attractive Quality

One significant business problem is lack of alignment between the way people work to design and produce products and the concerns and interests of customers in those products. This lack of alignment is caused by a discontinuity in the language of consumers and producers. Whereas a producer tends to focus on organizational performance, customers are most concerned about product performance. Their priorities are greatly different. The customer is most concerned about issues like ease of use, timeliness, certainty of performance, cost to own, and variety or choice in the product's features. Most producers tend to be more inwardly focused on such concerns as productivity, schedule, standards, cost to produce and volume of output. This is a myopic focus on operational quality whereas expanding the producer's perspective in a way that incorporates the consumer viewpoint develops strategic applications of quality for a business. It is no wonder that customers are not well satisfied by the market offerings – for example, the American Customer Satisfaction Index shows a chronic 20% dissatisfaction in its consumer rating across all industries. Thus, an important question for business leaders to ask is how can they drive improvement in both operational and strategic performance? Thus, Kano describes his theory this way: "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." So, how are operational and strategic considerations for quality development put into the Kano Model?

A graphical presentation of the Kano Theory of Attractive Quality is constructed with two axes that define three relationships in the ability of customers to identify their requirements for a product's features (see diagram below for a graphical depiction of these axes and relationships).

The Kano Model consists of a grid defined by two axes: the vertical dimension (Y-axis) defines the degree of customer satisfaction while the horizontal dimension (X-axis) represents the degree of fulfillment for a specific deliverable requirement. In all descriptions of the model the vertical axis is defined as a customer satisfaction dimension while in some explanations the horizontal axis is defined as the "execution excellence" for the characteristics under comparison. In presenting the Kano Model in this paper, a more general description will be used: "How well we do our work." This term is chosen because it applies to developing hardware, software, or services and it places emphasis on embedding quality into the design delivered by the teams that work on the product development phase and prepare the "actual entity" for transitions into its intended market.

The Kano Model uses three curves to describe the relationships between quality of the delivered design and the customer satisfaction perceived with the design. In the original model the three curves were labeled "Must Be Quality," "One-Dimensional Quality," and "Attractive Quality." In Figure 3 this Kano Model construct is presented to describe the Theory of Attractive Quality.

How should these two axes and three characteristic functional requirements be understood?

- **Customer Satisfaction:** This axis describes the range of customer satisfaction/dissatisfaction the design features of an actual entity. Customer satisfaction measures the difference in

the expectation for quality performance as compared with the perception of quality results that are actually delivered. A useful way of looking at customer satisfaction is the degree that customers appreciate the value of the feature; are willing to recommend it to others; and their willingness to repurchase that “entity” at the next time that they require a similar one.

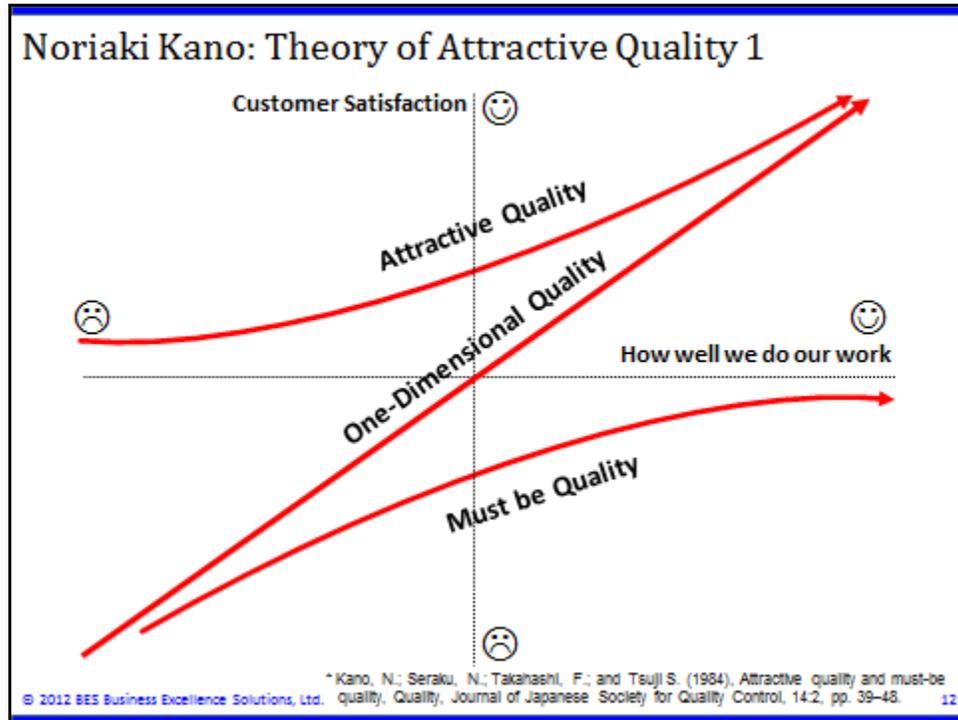


Figure 3: The Kano Model of Attractive Quality

- **How well we do our work:** This axis identifies the physical fulfillment (execution excellence) or the degree to which a product or service is able to perform its specified functional requirement relative to the capabilities of the competing products or industry standards. The better a design, the more enhanced the relative position of the product or service as a choice by customers. This comparative assessment of execution excellence is a head-to-head evaluation which decides the product differentiation among competing market choices available to customers.
- **Must-Be Quality:** (describes features or functional requirements that are expected, implicit or basic requirements). Customers expect these requirement to be consistently met by the delivered entity. Dissatisfaction is increased if the requirement is not met, but satisfaction is not increased if the requirement is met or exceeded. Such requirements are “dissatisfiers” if they do not deliver the basic level of customer satisfaction) or they may act as “satisficers” which only must be designed to be “good enough” as additional performance has no added impact on satisfaction. The typical strategy for designing such functional requirements is to deliver desired performance at minimum cost with no extra capability in these areas as such characteristics do not influence the buyer’s purchasing decisions. But, if poor performance on such characteristics occurs, this will create a very emotional negative customer response

which can have reputation-damaging consequences.

- **One-Dimensional Quality:** (normal, competitive or explicit requirements). These “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 that are requested by customers – typically in a request for proposal, purchase requisition, or “shopping list” that has been informally drafted by the consumer. In this dimension competition is based on the relative perceived value-benefit combination. Customers will seek to maximize their concept of value (both psychological or esteem value as well as financial value) for the purchase of the entity. Here the satisfaction is directly proportional to the performance-value equation and customers will make, more or less, rational judgments based on their perceptions of these parameters.
- **Attractive Quality:** (undiscovered quality requirements anticipating consumer needs). In the case of this category of requirements, there is a difficulty from the consumer’s perspective as they often are not aware of the value or benefit of such features or functions. This is a case where the designer-producer has obtained certain customer insights about the use of the entity that they have been able to anticipate a need. If that need is validated in the real market, 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 (there may, however, be some slight dissatisfaction if a customer perceives that the feature or function has no value and has added to the product cost and they must pay for the useless capability. This quality function provides an opportunity to increase the competitive value of a product or service and thereby potentially ‘excites’ the customer.

Spoken vs. Unspoken Quality Requirements

Thus, these curves describe three different classes of generic customer requirements. Each of these curves has a different degree of openness in the way that they describe the customers’ level of awareness of the explicit or implicit nature of these requirements. This characteristic is what Kano identifies as “spoken” for quality characteristics in the features or functions that are delivered to customers which the customer has requested. According to Kano, features and functions may be either “spoken” or “unspoken” in terms of the consumer’s own awareness. The Kano Model identifies its three classes of functional requirements according to the degree of awareness perceived by customers. These relationships are mapped in Figure 4. Together these ideas define quality characteristics that are able to explain fundamental relationships between consumer behaviors and product design.

In his model, Kano identifies as “spoken” requirements what he had called “one-dimensional quality” requirements while both “attractive quality” and “must-be quality” requirements are considered “unspoken” requirements. These two categories are described more fully as follows:

- **Spoken Quality Requirements:** Sometimes customers can express what they want in a product or service. At these times they define or specify requirements that must be delivered, and this will typically generate a performance specification or statement of work that constitutes 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 can be made. However, not all needs are fully understood by customers.

- **Unspoken Quality 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 such cases the customers cannot anticipate the nature of the new requirement.

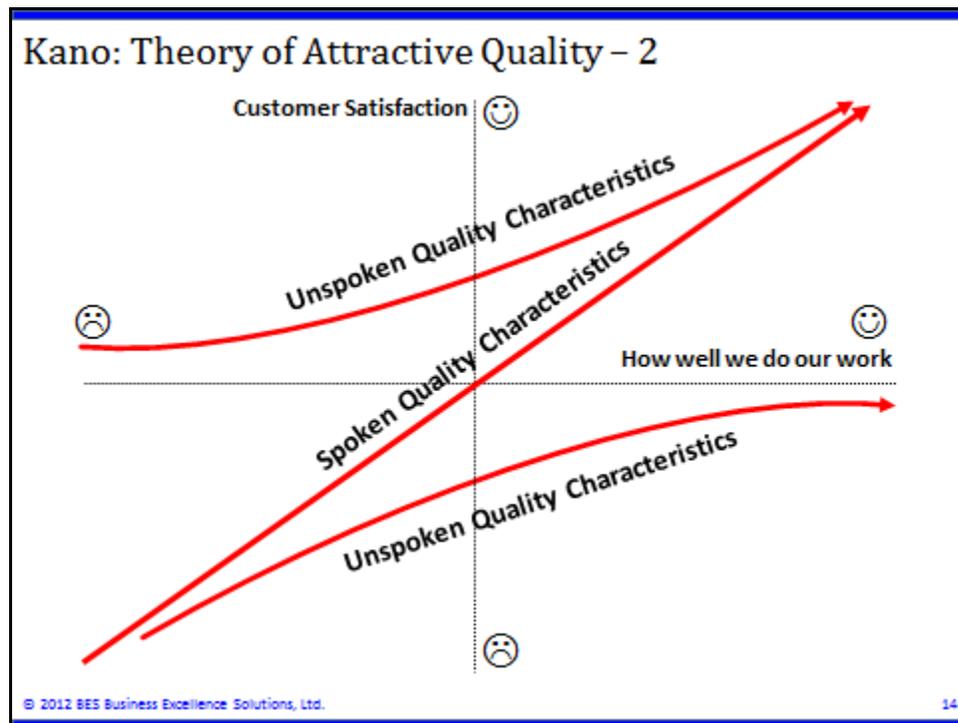


Figure 4: Spoken and Unspoken Quality Requirements Observed in the Kano Model

Dynamics behind the Kano Model

Kano’s model is not a static representation of the competitiveness of an organization’s portfolio of products and services. There is a natural progression in the distribution of innovative product features. While an innovative feature will provide product “leadership” in a market as long as it is perceived as delivering “attractive quality”, it will fall to the “competitive” performance level as competitors observe its value and strive to imitate its capability and customers evaluate it as a “one-dimensional quality” item. Over the long term, such a feature may eventually fall to the “basic” level of a “must-be quality” item when customers expect that all viable products possess this capability. This natural transition of innovative product features leads customers to anticipate certain trends in the path of “feature migration” which each competitor must learn to

observe as a marketplace expectation. It is also true that customers expect that each new product will be equal to or surpass the prior generation's capability. This is particularly true for product quality. To understand how this migration operates, two other insights into the operation of the Kano model must be described: the disciplines of strategy and the quality focus areas.

The Kano Model and Strategic Disciplines of Business

Jim Collins and Jerry Porras in a 1995 book *Built to Last* identified characteristics of companies that were able to sustain performance over. Collins and Porras observed that these companies followed a dualistic path to achieve success – they preserved their core values while at the same time acting innovatively to stimulate progress. Core ideology is the focal point – a blending of guiding principles, the belief structure of the firm, and business purpose, the vision or direction that determines why the firm exists. The guiding principle from this work is that the way of working a group chooses can create a sustainable corporate “innovation” engine that allows a company to clearly focus on delivering its value proposition over the long haul.

A company's value proposition contains two elements. The first is the explicit promise of value that is given to customers. The second element is the strategy or combination of actions that are taken to deliver a “consistent way of working” that delivers the value proposition of and that reflects constancy of purpose in fulfillment of the organization's promises. Both elements of a value proposition – its goal (the promise) and its delivery process (internal way of working) have been defined in a 1995 book *The Discipline of Market Leaders* by Fred Treacy and Michael Wiersema. Treacy and Wiersema agree with W. Edwards Deming (*The New Economics* (1994)) that organizations must have a “constancy of purpose” in their promise or offering to the market (e.g., there should be a consistent combination of service, convenience, price, quality, selection, etc.) Also essential to a company's ability to last is its operating model for how it transfers these promises to customers: the set of business processes, cultural norms, operating systems and functional competence that creates the ability to deliver on the value proposition. Finally, an organization must choose its value discipline. A value discipline describes the way a company combines the features of their operating model for the delivery of their value proposition to achieve differentiation in their chosen market. Treacy and Wiersema identify three different value disciplines that create different types of customer value: operations excellence, customer intimacy, and product leadership:

- **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 merely the cost of acquisition. An organization that is operationally excellent is a strong price competitor, but it achieves this capability through flawless execution of its work.
- **Customer Intimacy:** A discipline of adjusting products and services in ways to better fulfill 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.
- **Product Leadership:** A discipline of delivering technological innovation to the customer

through introductions of technologies that facilitate performance of the customer's job. This discipline constantly seeks new technologies that are available for exploitation by incorporation in products as engineering functions that create new marketable features that greatly improve the way customers can perceive the quality of the product or service deliverables.

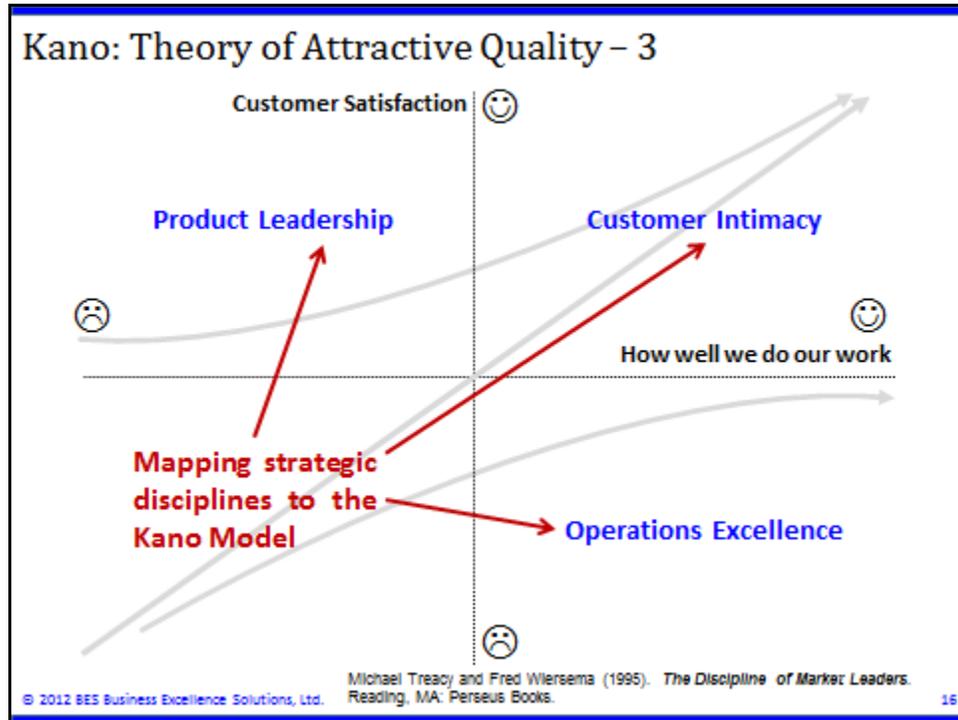


Figure 5: Mapping Strategic Value Disciplines to the Kano Model

Treacy and Wiersema state that to achieve "lasting excellence" (described by Porras and Collins) and to achieve business leadership through sustained growth, a company must make an explicit choice to demonstrate consistent excellence in one of these three areas of competence.

These value disciplines may be related to the Kano Theory of Attractive Quality by overlaying a Johari window to describe individual competence using the two axes of the Kano model. This structure (see Figure 5 above) identifies distinct quadrants which may be envisioned as strategic approaches to value delivery. In each of these four quadrants a different competitive focus is required of an organization based on these value disciplines

The Product Life Cycle introduces a Dynamic Cycle that Requires Continuous Innovation

It is difficult to extrapolate from the Kano model to corporate strategy. The reason for this difficulty is that the companies manage a portfolio of products, each of which is at a different moment in its product life cycle. When products are first released, they may fall into the innovative domain of product leadership. As competition recognizes the value acceptance by customers, they will seek to replicate the same capability and the value proposition decreases from attractive to competitive performance. As competition increases and the customers begin

to rely on this capability, then the product transitions from the competitive dimension into the expected or “must be” quality characteristic that is found in a commodity view of the product’s capability. This is the natural effect of gravity that stimulates the need for continuous innovation.

The speed of this transformation from innovative to commodity feature is characteristic of each particular industry. In the cellular phone or laptop computer businesses this cycle time is now measured in months. The implication of this observation is that every company must be able to simultaneously produce its output using all three value disciplines, if it wants to remain a market leader over the long haul.

While Treacy and Wiersema believe that a company must choose only one market discipline in which to excel, their proposition must be challenged in the circumstance where the speed of the product life cycle turnover is so rapid that the business model never rests in equilibrium. Under the pressure for a constant stream of new products, it is essential that companies manage their entire product portfolio and drive innovation based on customer insight that comes from nurturing an intimate relationship that leads to an imaginative understanding of emerging ideas or applications which will prove exciting to customers. At the same time, the design of these new technologies must be fault free because there is no time for correction of deficiencies in a product once it has been introduced.

Competitive excellence is achieved when a company is able to constantly recreate high levels of “exciting quality” while paying attention to the fundamentals of product reliability and design creativity into product features and functions which correctly anticipate the true needs of its customers.

Companies that enjoy sustained success must discover within themselves the ability to reinvent their greatness. The Kano Theory of Attractive Quality provides an important insight into the set of actions that such a company must consider. If a company makes a mistake in the bottom two curves of the Kano model, then no matter how much innovation is in a product or how extensive the capability to design exciting products and features, it simply does not matter. Mistakes on these bottom curves invoke a response that is very similar to the Hierarchy of Needs identified by Abraham Maslow – survival needs, such as security or safety, will always overwhelm the need for personal development or self-actualization. So, how should a company focus itself to define its path forward to achieve excellence in its performance? We must return to understand the goal or purpose that the organization sets for its performance.

The Kano Model and Quality Focus Areas

Performance improvement is required of organizations – to maintain competitive position it is essential that organizations assure quality in products, services, and business. What and how an organization choose to manage for quality defines the focus for its quality activities and there are three corresponding focus areas that relate to the Kano Model functions: compliance quality, improvement quality, and quality excellence. Since the competitive environment is dynamic, top management must focus on continuous innovation for requirements in all these areas.

- **Compliance Quality:** The ‘must be’ quality requirements can be thought of as compliance quality – delivering 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 minimal consideration – 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. In this quality focus area that is addressed using standards where compliance is the requirement.



Figure 6: Identifying Quality Focus Areas using the Kano Model

- **Improvement Quality:** The ‘one-dimensional’ quality requirements can be thought of as competitive 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 to differentiate value. The quality focus area here is a disciplined and rational approach to the continual improvement of the organization to maintain incremental performance advantage.
- **Quality Excellence:** ‘Attractive’ quality requirements can be thought of as the results of innovative quality – creative analysis and consideration of customer needs and the customer’s application environment leads to an introduction of new product features or the reformulation of product features in a way that is appealing to customers and provides a unique design for the product. In this dimension innovative design applies new technology to anticipate needs that the customer cannot express. This quality focus area pursues the highest level of performance that leads to recognition of the organization’s leadership in the field of quality.

Implementation activities should be planned to drive the appropriate quality focus in each of the three value disciplines. Such action describes a process for “Leadership through Quality.”

The Kano Model and Motivation for Feature Development

The Kano model identifies three “critical-to” factors in its three quality dimensions (Figure 7). Characteristics of these three “critical-to” factors and their relationship to the Kano Model features are described below:

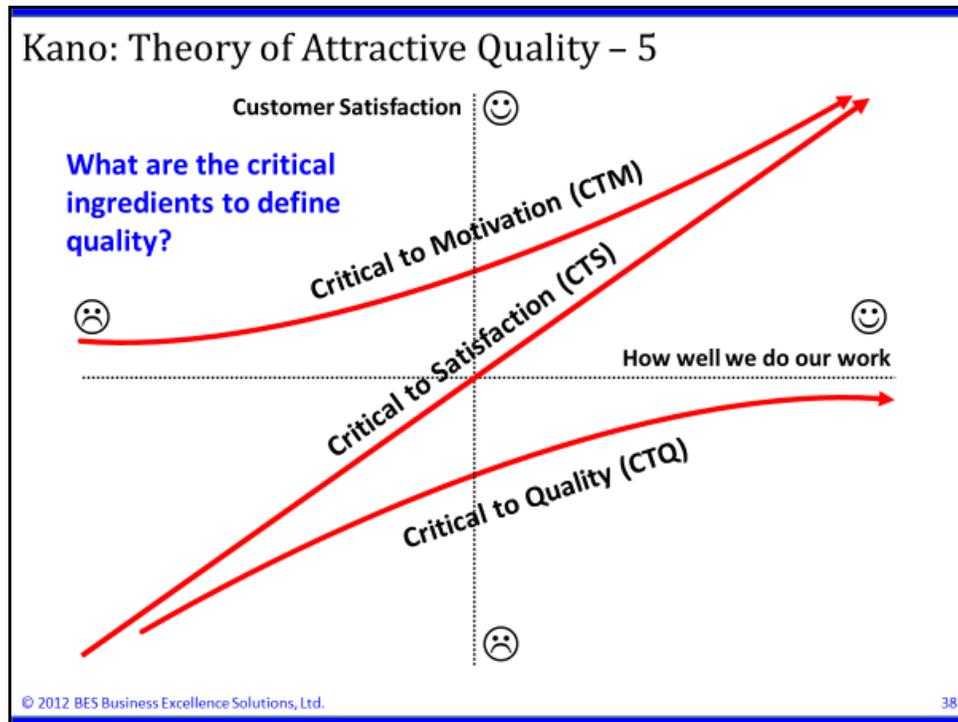


Figure 7: Understanding Critical Characteristics of Quality Features

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

features of the product.

The Kano Model and Leadership through Quality

Leadership through Quality defines actions to be taken to sustain perceived leadership in the quality outcomes of business strategy. This requires continuous innovation leading to excellence. There are three key focus areas of Leadership through Quality that align with the Kano Model (see Figure 8). Quality professionals should focus on continual improvement in these areas.

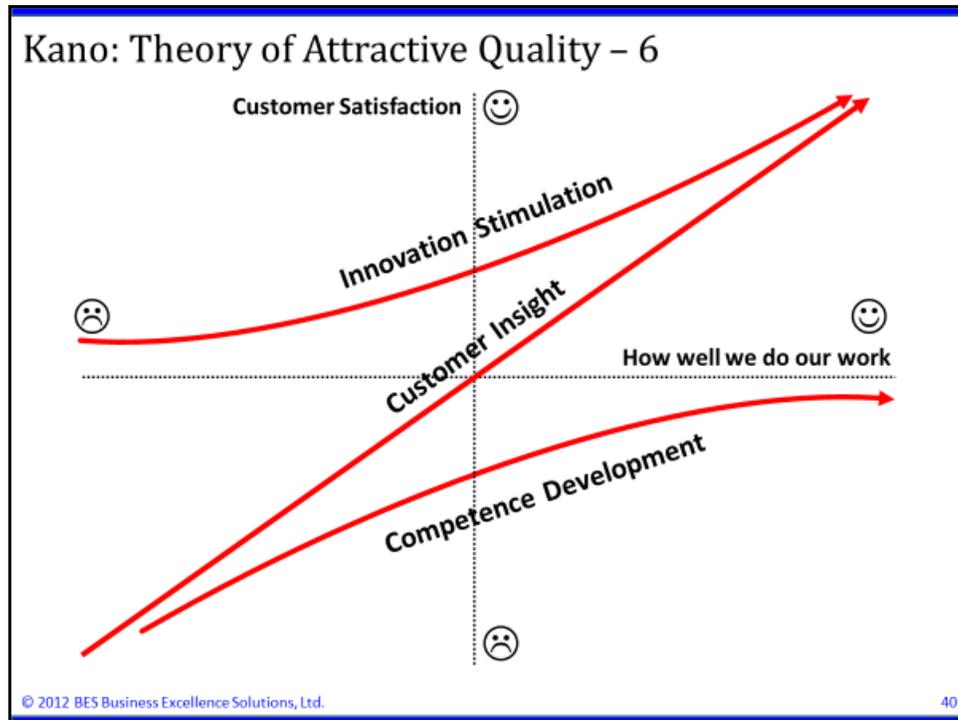


Figure 8: Focus Areas that Drive Leadership through Quality

Due to the need to counteract the natural forces that tend to degrade the energy contained in a system (e.g., gravity or entropy), it is imperative that organizations develop explicit strategies to renew the creative energy in such a system. Focus on actions that improve these dimensions of Leadership through Quality will achieve the focused renewal necessary for maintaining a high level of sustained competitiveness.

- **Competence Development:** Organizations can only be as good as the synergy created by 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. This will only happen when the capability and capacity to serve future needs are developed and expressly embedded in the human resources of the organization.
- **Customer Insight:** Organizations that can perceive emerging requirements of their

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. The 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 an 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.” This is how exceptional customer value is created: “seeing things differently” and applying imagination to create useful developments of technology that create an exciting environment that is attractive to customers.

Figure 9 summarizes the series of transformations that the Kano Model has experienced in the process of identifying the different components of quality dimensions that it expresses.

Table of transformations in the Kano Model:						
This presentation uses the Kano Model as a means to understand what is most important for development of a quality strategy for holistic development of a business strategy for quality improvement. This table summarizes the set of 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	Quality Feature Distinction	Resulting Quality Performance	Emphasis for Action Plans
Attractive Quality	Unspoken Quality Characteristics	Product Leadership	Excellence Quality	Critical-to-Motivation	Differentiated Quality	Innovation Stimulation
One-Dimensional Quality	Spoken Quality Characteristics	Customer Intimacy	Improve ment Quality	Critical-to-Satisfaction	Competitive Quality	Customer Insight
Must-be Quality	Unspoken Quality Characteristics	Operations Excellence	Compliance Quality	Critical-to-Quality	Commodity Quality	Competence Development

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Figure 9: Summary of Quality Dimensions Embedded in the Kano Model

Organizations that seek to win the competitive market battle, must consciously seek a strategy of continual improvement: a reasoned approach to becoming better in those critical dimensions that will be able to provide differentiation that leads to an advantage in their market position. A foundation for such a strategy is the competence of individuals who are motivated to participate fully in a collaborative effort toward mutual development that leads to advantage in the marketplace. Such an effort requires the stimulation of the innovative capacity of all participants in order to achieve excellence as a consistent result in the organization’s performance.

References:

1. Robert T. Buzzell and Bradley T. Gale (1987), *The PIMS (Profit Impact of Market Strategy) Principles* (New York: Free Press).
2. Clayton M. Christensen (2003), *The Innovator's Solution* (Cambridge, MA: Harvard Press).
3. Ronald H. Coase (1990), *The Firm, The Market, and The Law* (Chicago: University of Chicago Press).
4. Jim C. Collins and Jerry I. Porras (1995), *Built to Last* (New York Harper Collins).
5. W. Edwards Deming (1994), *New Economics* (Cambridge, MA: MIT Press).
6. Frederick I. Hertzberg, Bernard Mauser, and Barbara Bloch Snyderman (1959), *Motivation to Work* (New York: John Wiley).
7. Noriaki Kano, et. al. (1984), "Attractive Quality and Must Be Quality," *Quality Journal* (Tokyo: Japan Society for Quality Control), Vol. 14, No. 2, pp. 147-156
8. Yoshio Kondo (1989), *Human Motivation: A Key Factor for Management* (Tokyo: 3A Corporation).
9. Abraham H. Maslow (1954), *Motivation and Personality* (New York: Harper & Row).
10. Douglas M. McGregor (1960), *The Human Side of Enterprise* (New York: McGraw-Hill).
11. Joseph A. Schumpeter (1950), *Capitalism, Socialism and Democracy* (New York: Harper & Row).
12. Walter A. Shewhart (1931), *The Economic Control of Manufactured Product* (New York: Van Nostrand).
13. Fred Treacy and Michael Wiersema (1995), *The Discipline of Market Leaders* (Reading, MA: Perseus Books).
14. Ludwig von Mises (1949), *Human Action: A Treatise on Economics* (New Haven, CT: Yale University Press).
15. Gregory H. Watson (2003), "Customers, Competitors and Consistent Quality," in Tito Conti, Yoshio Kondo, and Gregory H. Watson, editors, *Quality into the 21st Century: Perspectives on Quality, Competitiveness and Sustainability* (Salem, NH: GOALQPC).
16. Alfred North Whitehead (1929), *Process and Reality* (Cambridge, MA: Harvard Press).



Forces Driving Leadership through Quality

BUSINESS EXCELLENCE SOLUTIONS



1

Career Summary – Gregory H. Watson



Gregory H. Watson is presently Chairman and Academician in the International Academy for Quality (IAQ). He is a past-President and Fellow of the American Society for Quality (ASQ) and a Fellow of the Institute for Industrial Engineers. He holds advanced degrees in engineering, law and management and is a registered European Engineer (EUIng) in both systems and industrial engineering. Mr. Watson is President of Business Excellence Solutions, Ltd., a Finland-based management consulting company and he has previously held executive positions with Xerox Corporation, Compaq Computer Corporation and the Hewlett-Packard Company. He is the author of ten books. ***Strategic Benchmarking*** (John Wiley, 1993) was chosen by ***Fortune Magazine*** as a Book-of-the-Month selection and named by ***Library Journal*** as one of the twelve best business books of 1993. Among the awards he has received, Mr. Watson is the first non-Japanese recipient of the Deming Medal from the Union of Japanese Scientists and Engineers. He also received the Distinguished Service Medal from ASQ, the Magnolia Quality Contribution Award from the City of Shanghai, and the Gold Medal of the Finnish Society for Quality.

2

To **be** better, we must **learn**...

... to **do** better we must **act**!



Confucius [Kong Qiu] (551-479 BC)

"What you know, you know; what you don't know, you don't know."

~ Confucius

"Wisdom is knowing what you know and what you don't know."

~ Confucius

We must do the **right thing**, in the **right way** at the **right time**!

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3

Summary:

Forces Driving Leadership Through Quality

Leadership through Quality focuses on continual improvement of work

Compliance quality assures reliability in basic performance expectations

Improvement quality assures competitiveness of performance results

Excellence in quality provides differentiation through attractiveness

Customer insight, stimulation of innovation, and technical competence development are required to assure sustainable quality leadership

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Forces Driving Leadership through Quality:



- Part 1: Managing for Quality by Design
- Part 2: Innovation Stimulation
- Part 3: Competence Development
- Part 4: Customer Insight
- Part 5: Systems for Quality Development

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BEST
LEAN SIX SIGMA®
19 June 2012

Part 1: Managing for Quality by Design

BUSINESS EXCELLENCE SOLUTIONS



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6

To master reality, we must understand theory!

“Successful problem solving requires **finding the right solution to the right problem**. We fail more often because we solve the wrong problem than because we get the wrong solution to the right problem.”

Russell L. Ackoff, *The Art of Problem Solving*, 1978

“**Forecasts are not prophecies**: their function is simply to **minimize the unknown factors** as much as possible.”

Henri Fayol, *General and Industrial Management*, 1916

“**All models are wrong, some models are useful**. Every model is an approximation – it is the data that is real (they actually happened!). **Don't fall in love with a model**. The model is a hypothetical conjecture that might or might not summarize and/or explain important features of the data.”

George E. P. Box, *Statistics for Experimenters*, second edition, 2005

Summary:

Managing for Quality by Design:

Quality improvement must focus on working process and its content

Focusing on quality increases the results of business performance

Motivation for quality must encourage participation in improvement

Attractive quality is designed for functions based on customer insight

Excellence is achieved through a disciplined process of implementation

Both management and engineering have responsibility for quality

Forces Driving Leadership through Quality:



- **Part 1: Managing for Quality by Design** ←
- Part 2: Innovation Stimulation
- Part 3: Competence Development
- Part 4: Customer Insight
- Part 5: Structure for Quality Development

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Topics related to managing for quality by design:



- Understanding Consumer Behavior
- Obtaining Excellence in Quality
- Managing for Quality in Business

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UNDERSTANDING CONSUMER BEHAVIOR

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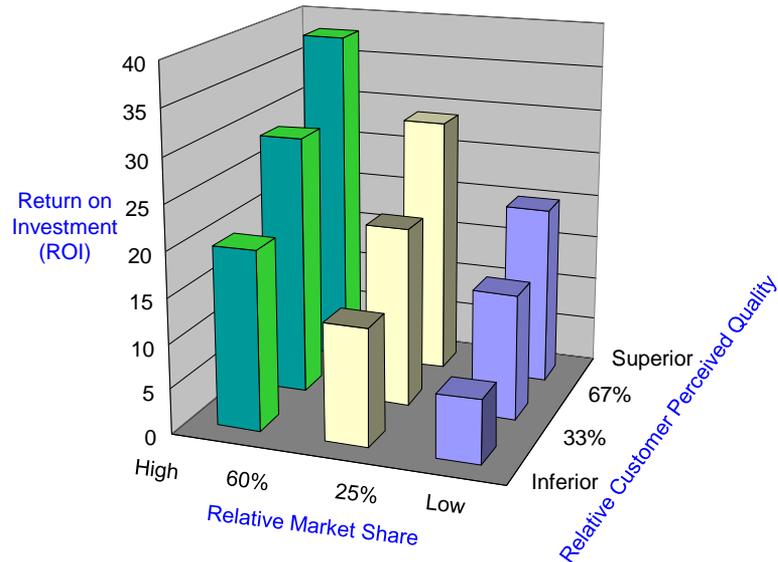
Consider quality as a customer-oriented system:

- Many balk at definitions like “I’ll know it when I see it!” – quality must be **producible on purpose** – not an accident! Quality must be capable of being designed to meet the needs and expectations of its customers.
- They prefer to judge quality using compliance to standard requirements and they speak of a **probability of meeting standard expectations** (e.g., process capability).
- Additionally, they observe that the means for delivering the result must contribute to the cost-effectiveness of the total outcome – **investments in process waste do not purchase quality outcomes**.
- When defined this way, **quality must be understood from a systems perspective: both its content and a process to consistently deliver customer-expected results.**

Does a emphasis on quality produce a benefit to organizations?

12

Customer quality judgments and decisions drive profit:



* Bradley T. Gale, *The PIMS (The Profit Impact of Market Strategy) Principles*, Free Press, 1987.

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What do we really mean by quality?

- Quality is 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 also the means by which we assure these attributes and circumstances are capable to satisfy our expectations for such value.
- 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 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.

How does this relate to people?

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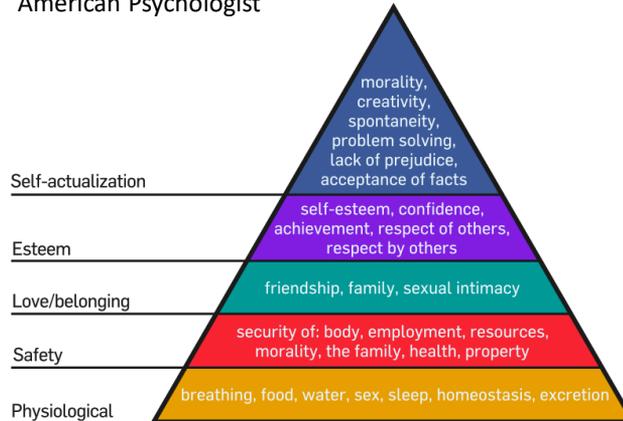
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Foundation: The psychological needs of people:



Abraham H. Maslow
(1908-1970)

Theory of the Hierarchy of Needs American Psychologist



Essential needs are for physiological survival, personal safety, and security in fundamentals of life (physical and economic)

What is the role of quality?

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Begin by building sensitivity to customers!



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

“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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Noriaki Kano: Theory of Attractive Quality – 1



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Dimensions of quality performance:

- **Must-Be Quality:** (expected, implicit or basic requirements). Customers expect this requirement to be consistently met by a product. Dissatisfaction is increased if the requirement is not met, but satisfaction is not increased if the requirement is met. Requirements are “dissatisfiers” (not delivering customer satisfaction) or “Satisficers” (delivering compromises in performance that do not fully meet the promise 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 or explicit requirements). These ‘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
- **Attractive Quality:** (undiscovered quality requirements anticipating 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 in a product or service and ‘exciters’ in a customer’s purchasing process.

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Kano: Theory of Attractive Quality – 2



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Conscious vs. unconscious quality requirements:

- **Spoken Requirements** – Sometimes customers can express what they want in a product or service. At these times they define or specify requirements that must be delivered and this will typically generate a performance specification or statement of work that constitutes 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 can be made. However, not all needs are fully 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 such cases the customers cannot anticipate the nature of the new requirement.

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OBTAINING EXCELLENCE IN QUALITY

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Performance strategies for delivering customer value:

Discipline in the daily management of work produces quality:

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 creates a “core competence” in its chosen proposition for delivery of value. The design of this approach needs to emphasize at least one of three disciplines in the pursuit of such core competence. *

These three organizational disciplines are:

- ✓ Product Leadership
- ✓ Customer Intimacy
- ✓ Operations Excellence

How do these disciplines influence the quality performance of organizations?

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

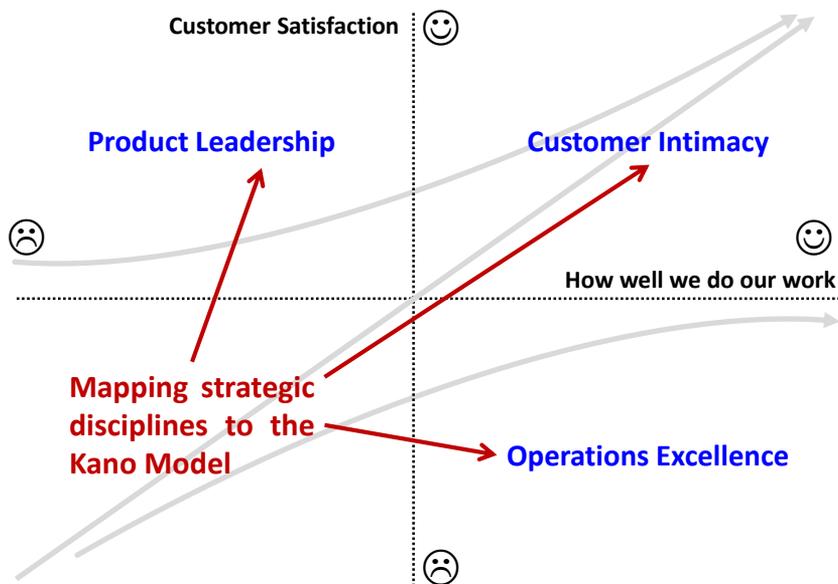
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Strategic disciplines of organizations:

- **Product Leadership** – A discipline of delivering technological innovation to the customer through introductions of technologies that facilitate performance of the customer’s job. This discipline constantly seeks new technologies that are available for exploitation by incorporation in products as engineering functions that create new marketable features that greatly improve the way customers can perceive the quality of the product or service deliverables.
- **Customer Intimacy** – A discipline of adjusting products and services in ways to better fulfill 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 a strong price competitor, but it achieves this capability through flawless execution of its work.

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Kano: Theory of Attractive Quality – 3



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Three dimensions of business quality performance:

- **Compliance** Quality – The ‘must be’ quality requirements can be thought of as compliance quality – delivering 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 minimal consideration – 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.
- **Improvement** Quality – The ‘one-dimensional’ quality requirements can be thought of as competitive 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 to differentiate value.
- **Excellence** Quality – ‘Attractive’ quality requirements can be thought of as the results of innovative quality – creative analysis and consideration of customer needs and the customer’s application environment leads to an introduction of new product / process features or the reformulation of product features in a way that is appealing to customers and provides a unique design for the product. In this dimension innovative design applies new technology to anticipate needs that the customer cannot express.

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Kano: Theory of Attractive Quality – 4



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What actions should business leaders take to improve?

Since the “innovativeness” of products does not endure forever, the achievement of quality excellence requires both a continuous stream of innovation in content for features and functions of new products, it also requires a continual emphasis on improvement; a reasoned approach to reduce waste and its resulting excessive costs that drive product pricing.

Thus, multiple simultaneous actions appear to be required: refreshment of new product portfolios with innovative features and functions; alignment of products to desirable requirements from targeted customers based on intimate knowledge of their application; and tightly-coupled control of both capable product design and workmanship of employees to assure that expected degradations in product performance do not influence the customer experience.

Such broad emphasis requires a more comprehensive approach to quality than just emphasis on the physical or service quality dimensions: it requires end-to-end involvement through inclusive participation of all functional areas to collaborate in the development of a management system that consistently produces quality.



MANAGING FOR QUALITY IN BUSINESS

Henri Fayol: Emphasized Continual Improvement



***General and Industrial Management* (1916)**

“The process of management is planning, organizing, coordinating, commanding, and controlling.”

Management requires ... “a constant search for improvements that can be introduced into every sphere of activity.”

Henri Fayol (1841-1925)

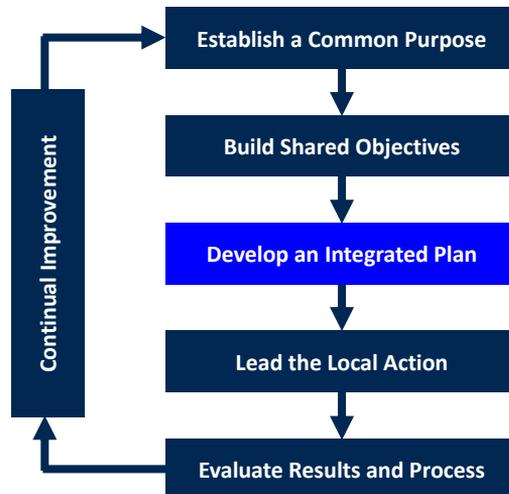
“The search for improvements should be pursued unceasingly at all levels and throughout all parts of the business. The executive in charge should have an active, unrelenting intention to effect improvements.”

Work in harmony!

So what is the process of managing for quality? *

The process of management is distinct from the content that is managed. Quality is typically associated with the content of management – it is related to performance of goods or services produced.

Quality must not be thought of as distinct from a process of management. It must be embedded throughout each activity within that process!



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

The purpose of quality differs in each Kano dimension:

- **Differentiated Quality** – Attractive quality delivers a differentiated capability to the organization – one that customer 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 shifts in the 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 is 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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Kano: Theory of Attractive Quality – 5



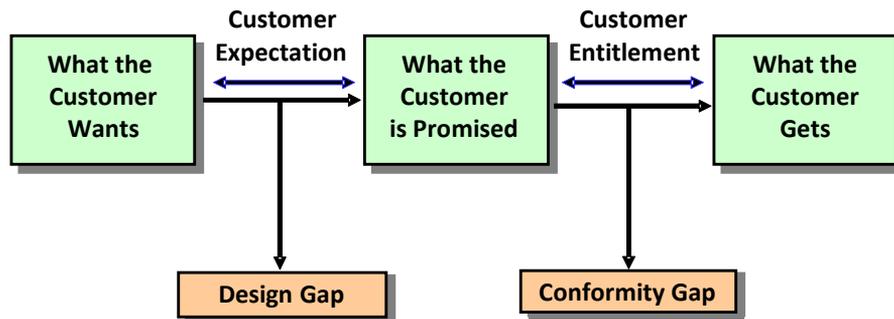
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Quality must be consciously designed!

Quality Delivery Model *



Quality in what is delivered Quality in how it is delivered

Making Choices → Doing Work

Getting the Right Idea → Implementing it the Right Way

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

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Excellence is a milestone on the quality journey!

What is "Quality"? How does quality differ from "Excellence"?

Excellence is result of habit – the habit comes from doing the right things in the right way which is the consequence of thinking and doing quality.

Quality matures into a mindset that prevails in individuals, teams and organizations and thinking quality motivates action to apply the principles, methods and tools of quality sciences to deliver "right work outcomes" as judged by the customers of the organization. **Quality includes everyone!**

How does quality differ from "Reliability"?

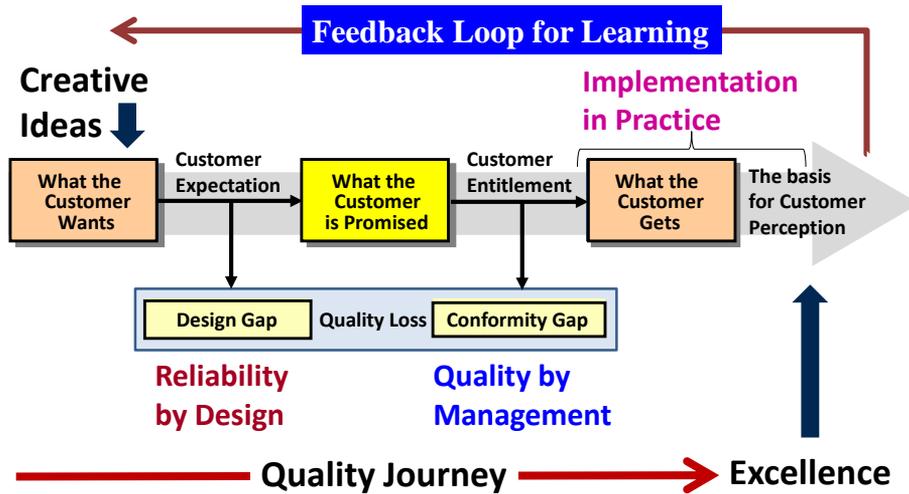
Reliability is an ability to consistently deliver a useful level of excellence in quality of performance over a sustained period of time in the operational environment of the customer – it helps customers to get their jobs done. It is reliability, not over-exaggerated promises of great performance, is what matters most for generating long-term customer confidence. **Reliability is sustainable, quality that lasts – designed with a capacity to endure.**

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Gregory H. Watson: Quality Delivery Model*

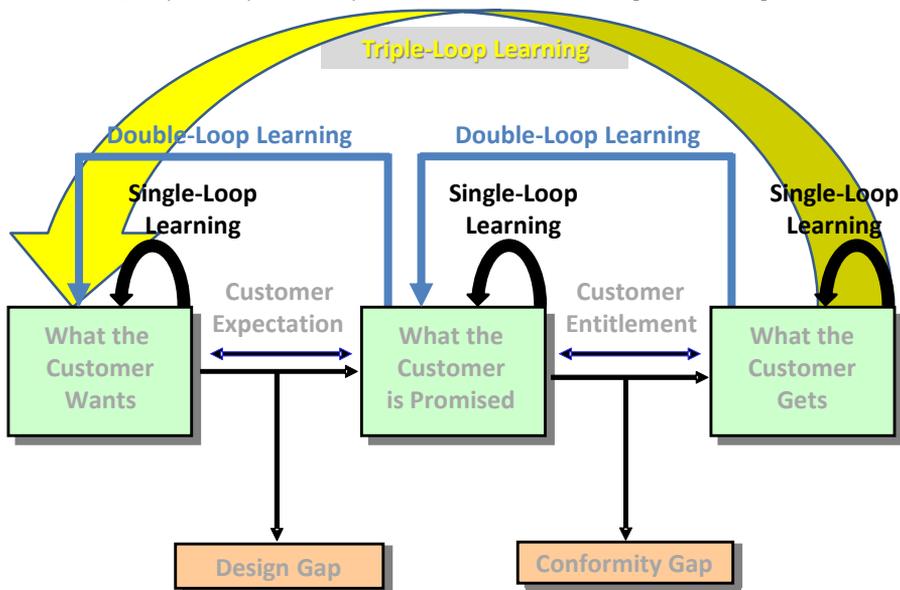


* Tito Conti, Yoshio Kondo, and Gregory H. Watson, "Competitive Quality," *Quality into the 21st Century* (ASQ Quality Press, 2003).

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Feedback loop specifies "Triple-Loop" Learning*

* More on the Quality Delivery Model may be found in the section on competence development.



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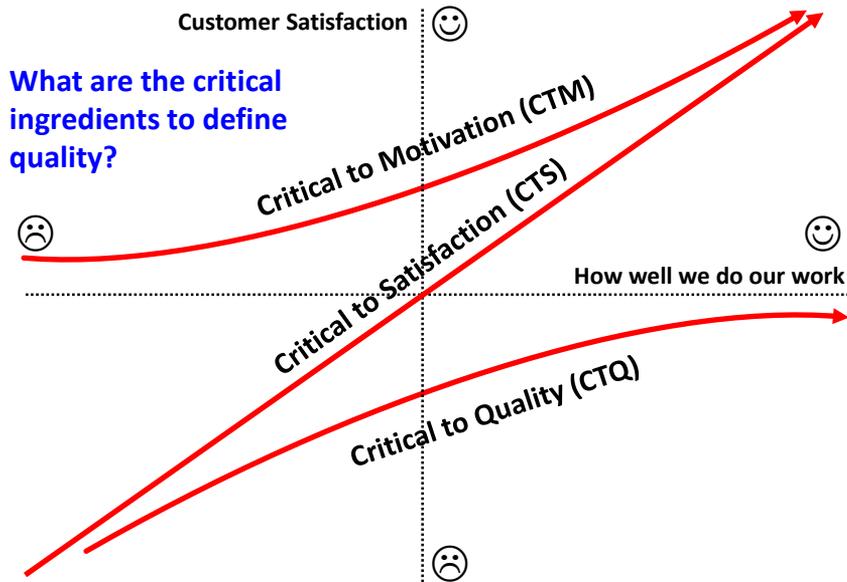
Excellence is achieved by disciplined implementation:

Implementation is a realization of a decision to change (intent) through the coordinated activities of its people (execution) resulting in a new way to do the routine work of the organization.

Factors affecting the effectiveness of the implementation of any innovation will include the urgency of need, strategic intent, process capacity for implementation (resources applied, current work load of the system, ability to change, interest group activity (both supporting and opposing), as well as the degree of executive support.

The social framework required to achieve implementation consists of three processes according to former Honeywell CEO Larry Bossidy and consultant Ram Charan in their book *Execution: The Discipline of Getting Things Done* (2002) **requires cooperation** among the people processes of the organization which must align with the strategy process in order to transition the intent of change into the operations processes. Execution **requires strong discipline** – implementation cannot be achieved by wishing or hoping; decisions should not be made by guessing or by other ad hoc methods:

Kano: Theory of Attractive Quality – 6



What are the degrees of quality embedded in features?

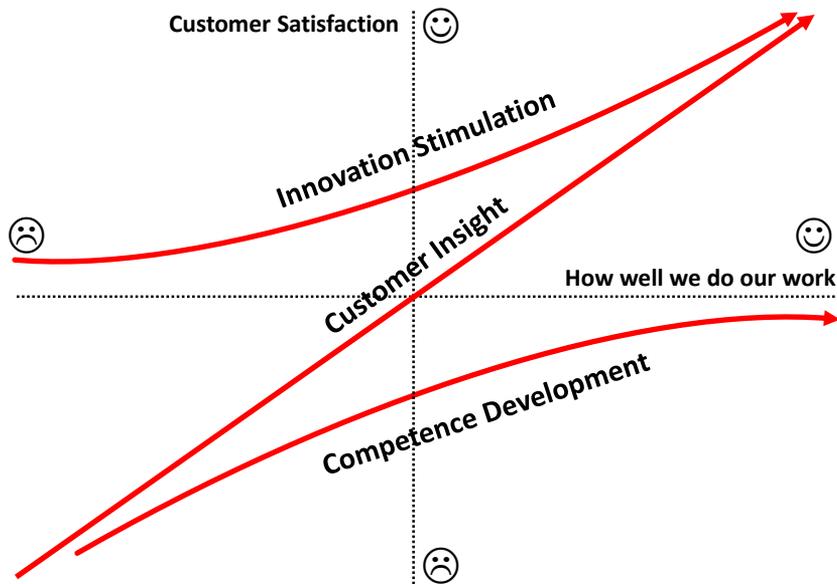
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Kano: Theory of Attractive Quality – 7



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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.
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Table of transformations in the Kano Model:

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One-Dimensional Quality	Spoken Quality Characteristics	Customer Intimacy	Improve ment Quality	Critical-to-Satisfaction	Competitive Quality	Customer Insight
Must-be Quality	Unspoken Quality Characteristics	Operations Excellence	Compliance Quality	Critical-to-Quality	Commodity Quality	Competence Development

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Is “Continuous” or “continual” improvement needed?

Continuous Improvement:

Continuous implies an uninterrupted sequence of changes that occurs without the benefit of managerial review. This resembles the “white water” of a raging river that is flowing continuously from its headwaters down a vertical pathway and cascading through its channel to its ultimate destination. ***This way is mindless and becomes rigid.***

Continual Improvement:

Continual implies a constant state of alertness - always being vigilant to determine if a possible change makes sense. Continual improvement, therefore, requires a rational review of opportunities in order to make strategic choices that will guide improvement. This review process is implied to be systematic and continuing indefinitely; it recurs regularly in a steady, rapid succession. ***This way is mindful and remains flexible.***

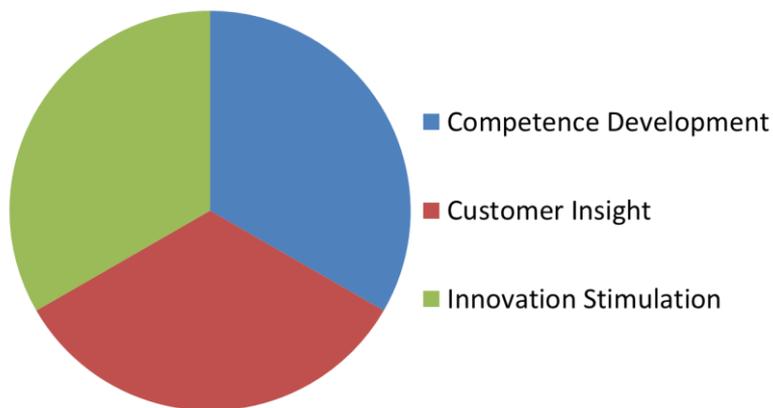
Gregory H. Watson, “A Comprehensive Approach to Quality Aims at Inclusive Growth,”
Journal of Quality & Participation, Vol. 34, No. 4, January 2012., pp. 16-20.

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Developing True Quality Requires Integrated Learning



A systems approach to these topics will create integrated learning.

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Thank you! Any questions?

BUSINESS EXCELLENCE SOLUTIONS





Part 2: Innovation Stimulation

BUSINESS EXCELLENCE SOLUTIONS



1

Innovation is a competence that can be learned!



Genrich S. Altshuller (1926-1998)

“The process of solving technical problems is accessible to anyone, important to learn, and very exciting to work through. We can teach everybody to invent.”

~ Genrich S. Altshuller

2

Summary:

Innovation Stimulation:

Innovation must generate a continuous stream of alternatives

Innovation can be learned and approached as a structured process

Innovation must satisfy improvement targets set by customer insight

Analytical tools can facilitate this structured innovation process

The critical innovation challenge is deciding among design alternatives

Design is the activity that introduces innovation into new products

3

Forces Driving Leadership through Quality:



- Part 1: Managing for Quality by Design
- **Part 2: Innovation Stimulation**
- Part 3: Competence Development
- Part 4: Customer Insight
- Part 5: Systems for Quality Development



4

Topics related to innovation stimulation:



- Continuous Innovation Imperative
- Theory about Innovation
- Pragmatics about Innovation
- Methods to Stimulate Innovation

5

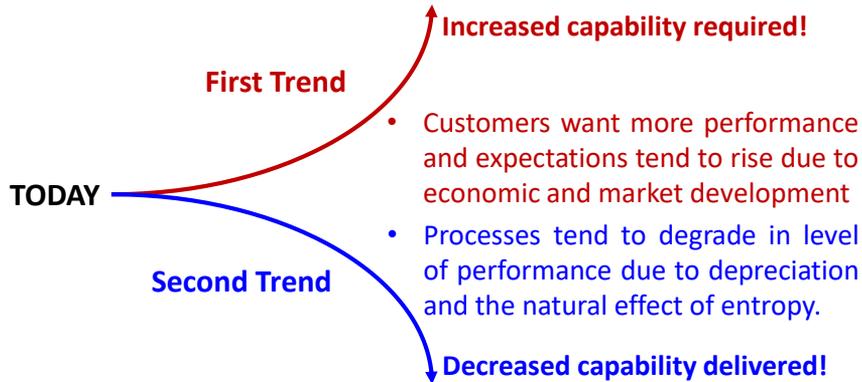


CONTINUOUS INNOVATION IMPERATIVE

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Motivation for continuous innovation:

Leaders are faced with two simultaneous trends:



$$\text{Capability} = \frac{\text{Results Expectation}}{\text{Process Performance}}$$

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Continuous innovation drives continual improvement!

Consumers make judgments about the capability of delivered goods and services based on their personal experience. Their satisfaction is based on a comparison of their perception of their experience with performance as compared to an initial expectation for performance.

When customers purchase a new product they have fundamental expectations of its capability: performance should be better (reliability of performance as well as the capability of features and functions) and cost should be equal, but preferably lower. Thus, customers have a rising expectation for continual improvement of the product that can be experienced through rational observation of their activity and experience in use of that product.

Rising expectations; however, can only be addressed through a systematic process of innovation which relentlessly drives promising, attractive features, functions, and applications into existence based on the organization's competence to design and its insight into customer activities. Thus, delivery of continual improvement is linked to stimulation of continuous innovation. How can a systematic process of structured innovation be managed?

$$\text{Satisfaction} = \frac{\text{Performance Perception}}{\text{Results Expectation}}$$

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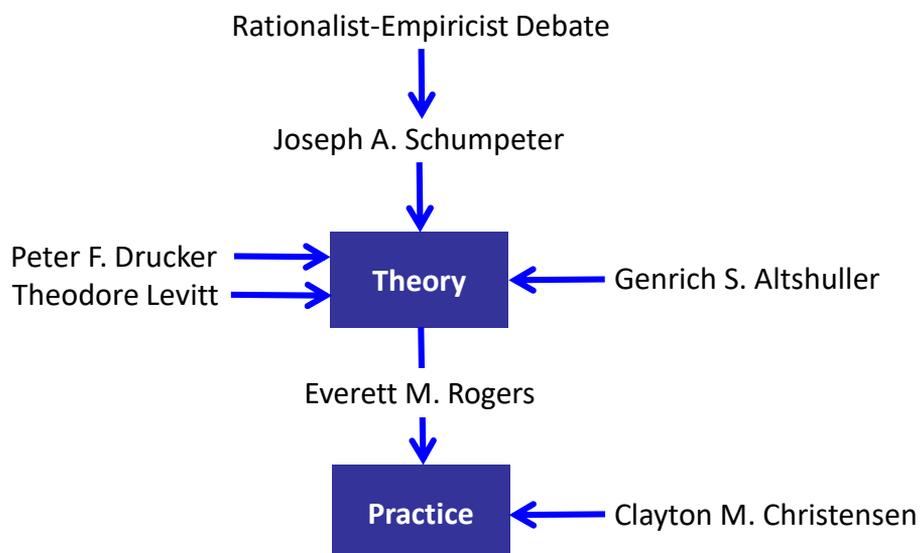
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THEORY ABOUT INNOVATION

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Understanding modern theory behind innovation:



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Rationalist-Empiricist debate and innovation:

Rationalism: truth comes by creation from intellect
Rene Descartes
Immanuel Kant

Empiricism: truth comes by sense and observation
Francis Bacon
David Hume

- *Giambattista Vico (1668-1744), The New Science (1709)*
- *Theory of Ingenium*: the power and capacity to: connect many separate, diverse elements; invent and synthesize from prior elements; perceive relevant similarities and construct theories that are applied from one research area to another; and gain insight into vague properties of suitability and fitness for use.

Pragmatism: truth is probabilistic and subject to further inquiry
Charles Pierce
John Dewey

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What is meant by innovation?

- Joseph Schumpeter (1883-1950) in *Capitalism, Socialism and Democracy* (1942) described how capitalism would be replaced by socialism as the old ways of doing things are systematically destroyed and replaced by the new in what he called "planned abandonment" of the old ways. Schumpeter's *Theory of Innovation as "Creative Destruction"* is a foundation for the European Union's Lisbon accord on innovation.
- In *The Theory of Economic Development* (1934) Schumpeter has defined innovation more thoroughly:
 1. The introduction of a new product or new level of quality in a product.
 2. The introduction of a new method of production or in a new way of handling a commodity commercially.
 3. The opening of a new market, that has not previously entered, whether or not this market has existed before.
 4. The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.
 5. The reorganization of an industry (creation of a monopoly position or breaking up of a monopoly position).

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Differentiating terms used in discussing design:

- **Creativity:** generation of imaginative ideas without regard to practicality or implementation; success is measured by the number of new ideas. Creativity refers to the **act of producing new ideas**, approaches or actions.
- **Invention:** the **imaginative discovery of ideas that define a potentially practical new device**, composition, gadget, or process that did not exist previously. Inventions may be derived from pre-existing works, or they may be independently conceived (a radical breakthrough).
- **Innovation:** ideas applied in practice; the entire process by which an organization generates creative new ideas and converts them into novel, useful and viable commercial products, services, and business practices. Thus, while *creativity* is the generation of novel ideas which is a necessary step within the innovation process. Innovation is **the process of both generating and applying creative ideas** in some specific context. Max McKeown in *The Truth About Innovation* (2008) observed that Innovation is “a new way of doing something or new stuff that is made **useful**.”
- **Engineering:** **designing and implementing useful features and functions** at the lowest total cost (including the cost of failure).

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Design is the engineering of innovation:

Engineering: “*discovery and design under constraints to address a particular challenge for a practical purpose ...*”

Distinct experiences of design:*

Category	Description
Evidence-based decision-making (Scientific method)	Design is finding and creating alternatives, then choosing among them through evidence-based decisions that lead to determine the best solution for a specific problem.
Organized translation (Process Mapping)	Design is the organized translation from an idea to a plan, product, or process that works in a given situation
Personal synthesis (Human element)	Design is personal synthesis of aspects of previous experiences, similar tasks, technical knowledge, and/or others' contributions to achieve a goal.
Intentional progression (Field and social context)	Design is dynamic intentional progression toward something that can be developed and build upon in the future within a context larger than the immediate task.
Directed creative exploration (Discovery)	Design is directed creative exploration to develop an outcome with value for others, guided and adapted by discoveries made during exploration.
Freedom (Facilitated ambiguity)	Design is freedom to create any of an endless number of possible outcomes that have never existed with meaning for others and/or oneself within flexible and fluid boundaries.

* Shanna R. Daly, Robin S. Adams, and George M. Bodner (2012), “What Does it Mean to Design? A Qualitative Investigation of Design Professionals Experiences,” *Journal of Engineering Education*, 101:2, pp. 187-219.

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Insight comes from “seeing things differently!”

“Discovery consists of looking at the same thing as everybody else and thinking something different.”

~ Albert Szent Györgyi, Nobel Laureate

Levels of Innovation – Genrich Altschuller (1926-1998)

The Innovation Algorithm (1999) 200,000 patents → 50,000 innovations

1. **Apparent or conventional solution** – 32% of all patents
Solution by narrow extensions to existing systems
2. **Small invention inside a paradigm** – 45% of all patents
Improving an existing system by compromise in a single technology
3. **Substantial invention inside a technology** – 18% of all patents
Improving an existing system using technology from other industry
4. **Invention outside technology** – 4% of all patents
New knowledge generated by application of science not technology
5. **Discovery** – 1%
Major discovery a new phenomena or new application of science, but, according to Drucker: “such innovation is kissed by the muses and often cannot be duplicated.”

Requirement for practicing systematic innovation:

Peter F. Drucker (1909-2005) *Innovation and Entrepreneurship* (1985) – 1:

“Innovation is the specific tool of entrepreneurs, the means by which they **exploit change as an opportunity** for a different business or a different service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced. Entrepreneurs need to search purposefully for the sources of innovation, the changes and their symptoms that indicate opportunities for successful innovation. And they need to know how to apply the principles of successful innovation.”

“Entrepreneurs will have to learn the practice of systematic innovation.”

“**Systematic innovation** therefore consists in the **purposeful and organized search for changes**, and in the **systematic analysis** of the opportunities such changes might offer for economic or social innovation.”

Innovation without implementation is worthless:

Peter F. Drucker (1909-2005) *Innovation and Entrepreneurship* (1985) – 2:

“Systematic innovation requires the monitoring of seven sources of innovative opportunities:

- “The *unexpected* – the unexpected success, the unexpected failure, the unexpected outside event;
- “The *incongruity* – between reality as it actually is and reality as it is assumed to be or as it ‘ought to be’;
- “*Innovation based on process need*;
- “*Changes in industry structure or market structure* that catch everyone unawares;
- “*Demographics* (population changes);
- “*Changes in perception, mood, and meaning*;
- “*New knowledge*, both scientific and nonscientific.”

Creative imitation – a paradox of differences:

Theodore Levitt (1925-2006), “*Innovative Imitation*,” *HBR* (Sept-Oct 1966):

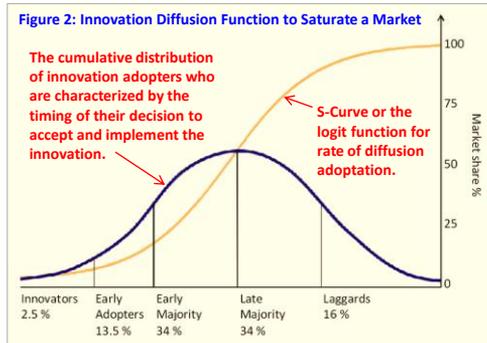
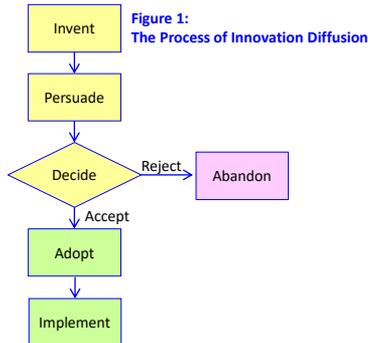
When we consider what we mean by innovation we will typically think of new concepts, breakthrough technologies, and original methods. However, when we talk about creative imitation we think of ‘me too’ or ‘second to the market’ followers of truly innovative organizations.

However ‘**creative imitation**’ really means that the following company has had the time to learn from the leader – gaining a better understanding of what the innovation means to the market and how to develop and position innovations better than the original introduction which was more ‘experimental’ in nature as the originator has only gained ‘approximate’ knowledge and has not had the benefit from an interaction with the reality of the market’s acceptance or application of the innovation.

The new reality of an innovation engages the customer to do the job that the customer wants and is willing to pay for. Creative imitation can become a way to establish market standards if a follower is willing to learn aggressively from the customers who are pioneering in its applications for implementation. So, a ‘creative imitation’ strategy rationalizes markets to learn rapidly how to adapt.

Diffusion of innovation – speed to implementation:

Everett M. Rogers (1931-2004), *Diffusion of Innovations*, 4th edition (1995)



Diffusion of innovation occurs over time and progresses through a series of stages. If an innovation is adopted, it spreads through market communication channels where the idea is promoted but rarely is it evaluated scientifically; so subjective perceptions of an innovation tend to influence diffusion decisions. Social systems determine the diffusion norms; roles of originators, opinion makers, and change agents; types of innovation decisions; and also innovation consequences. The rate of innovation diffusion is modeled as a logit function.

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Quality: Innovative knowledge of customers!

Peter F. Drucker (1909-2005) *Innovation and Entrepreneurship* (1985) – 3:

“Entrepreneurial management is more crucial to knowledge-based innovation than to any other kind. Its risk are high, thus putting a much higher premium on foresight, both financial and managerial, and on being market-focused and market-driven. Yet knowledge-based, and especially high-tech, innovation trends to have little entrepreneurial management.

“In large measure the high casualty rate of knowledge-based industry is the fault of the knowledge-based, and especially the high-tech, entrepreneurs themselves. They tend to be contemptuous of anything that is not ‘advanced knowledge,’ and particularly of anyone who is not a specialist in their own area. **They tend to be infatuated with their own technology, often believing that ‘quality’ means what is technically sophisticated rather than what gives value to the user.**”

Innovation typically will only approximate the ultimate ideal customer value proposition in deliverables. Creative imitation can deliver more precisely the content which maximizes value of products and services to customer-users; then innovation will drive competition in the right direction.

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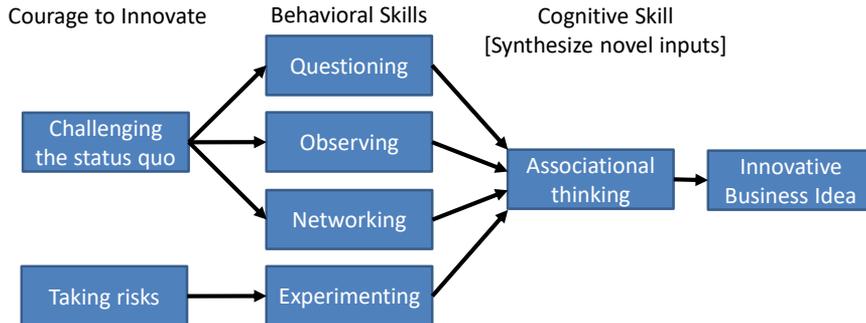
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Disruptive innovation & necessary skills of innovators:

Structured Innovation Process

Innovator's DNA Model for Generating Innovative Business Ideas *



Innovation can be developed and is capable of being converted into a process. Curious people who are willing to take (or are encouraged) to take risks can systematically develop processes that encourage questioning, observing, networking and experimenting as means to stimulate or act as catalysts for associational thinking: connecting ideas that previously had been unrelated to formulate a new concept.

* Jeffrey H. Dryer, Hal B. Gregersen and Clayton M. Christensen (2011), *The Innovator's DNA: Mastering the Five Skills of Disruptive Innovation* (Boston: Harvard University Press). More on these innovation skills in the next section on competence development.

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PRAGMATICS ABOUT INNOVATION

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Ritz-Carlton: Case study strategy for human innovation



The Ritz-Carlton Hotel Company, L.L.C.

“Innovation is the effort to create purposeful, focused change in an enterprise’s economic or social potential.”

~ Peter F. Drucker

George, Works, and Watson-Hemphill

Making Innovation Work (2005)

Development of a process for service innovation:

John C. Timmerman, *A Systematic Approach for Making Innovation a Core Competency*, 16 December 2007.

- Senior leadership must advocate innovation, broaden attitude toward risk-taking, accept failure as part of the innovation process, and allow time that is required for “harvesting” innovation.
- **Leadership’s innovation incubator must be intimately linked with the business strategy and not isolated in a think tank environment.**
- Frequent experimentation must occur in real-world work processes to assure the viability of innovative concepts and programs.
- Proposed Innovation process:
 1. Inspire vision and recognize opportunities
 2. Foster environment and promote benchmarking
 3. Stimulate ideas and encourage risk
 4. Test ideas and implement change

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Xerox: Case study of creative imitation methodology



Management innovation: the Process of Benchmarking (1979)

Benchmarking is a form of social system for communication of business process inventions. Benchmarking consists of a comparative analysis of performance measures between two similar organizations or processes. These measures are used to “triangulate” and determine which organization has the highest level of sustained performance, most consistent performance, and greatest breadth for application of the superior practice. Based on the evidence of the analysis the process is considered for “creative imitation” and “adaptation” to organizations that have not achieved the superior level of performance.

Benchmarking attempts to remove subjective judgment for process comparison and use scientific methods for accelerating the diffusion of productive process innovations.

Benchmarking is not just focused on comparative numerical performance or on the blind adoption of process innovation. Benchmarking applies the scientific method to encourage process improvement.

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Creativity required – emphasis on generating ideas!

Rhythm is the requirement: time-to-market and timing to market!

Time to market: how long it takes to develop an innovation for introduction to a market.

Timing to market: when the product is introduced into the market.

Comparative Dimension	Quality Management	Innovation
Evolutionary	Creativity Quality Standards Daily Management Employee Involvement Continuous Improvement Six Sigma DMAIC	Creativity Invention Product Variants Product Cost Reduction Product Line Extension Market Extension
Revolutionary	Creativity Management Leadership Business Reengineering Breakthrough Projects Strategic Quality (Hoshin) Six Sigma DFSS	Creativity Experimentation New Product Development Market Development Business Development Merger & Acquisition
Performance	Bottom-Line Savings Top-Line Growth	Market Growth Top-Line Growth

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Dorothy A. Leonard: Core Rigidity vs. Flexibility

- Harvard business professor Dorothy A. Leonard has 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.
- Leonard-Barton, D. A. (1995), *Wellsprings of Knowledge*, Boston: Harvard Business School.

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Core Rigidity vs. Core Flexibility:

What are the characteristics of your product development process?

Core Flexibility Characteristics

- Innovative
- Adaptive
- Mindful
- Dynamic
- Risk-embracing
- Open
- Accountable
- Transparent

Core Rigidity Characteristics

- Inhibitive
- Mechanistic
- Mindless
- Static
- Risk-avoiding
- Closed
- Collusive
- Opaque

David J. Teece: Theory of Dynamic Capability

- Dynamic refers to situations where there is rapid change in technology and market forces and this feedback affects the decisions of a firm.
- Dynamic capabilities exist in R&D, product and process development, advanced technology transfer, intellectual property, manufacturing, human resources (e.g., recruiting and competence development (skill-building)) as well as organizational learning.
- Dynamic capability tracks organizational and strategic means by which managers alter resources by acquiring resources, integrating them, or recombining them to create new strategies for competitiveness.

- Teece, David J. (1986). "Profiting from Technological Innovation," *Research Policy*, 15, 6, pp. 285-305.
- Teece, David J.; and Jorde, T. M. (1990), "Innovation, Dynamic Competition, and Antitrust Policy," *CATO Review of Business & Government*, Fall, pp. 35-45.
- Teece, David J.; Pisano G.; and Shuen A. (1997), "Dynamic capabilities and strategic management," *Strategic Management Journal* 18(7): 509-533.
- Teece, David J. (2007), "Explicating Dynamic Capabilities: the Nature and Micro-foundations of (Sustainable) Enterprise Performance," *Strategic Management Journal*, 28, 1319-50.



METHODS TO STIMULATE INNOVATION

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Methods that support dynamic product development:



- Morphological Box – Function vs. Technology Alternatives
- Mind-Mapping – Functional Decomposition
- Theory of Inventive Problem Solving – Structured Design
- Kano Function Map – Requirements Analysis
- Pugh Concept Selection Matrix – Alternative Selection
- Risk Leveling – Risk Mitigation Distribution

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Innovation methodology: Morphological Box

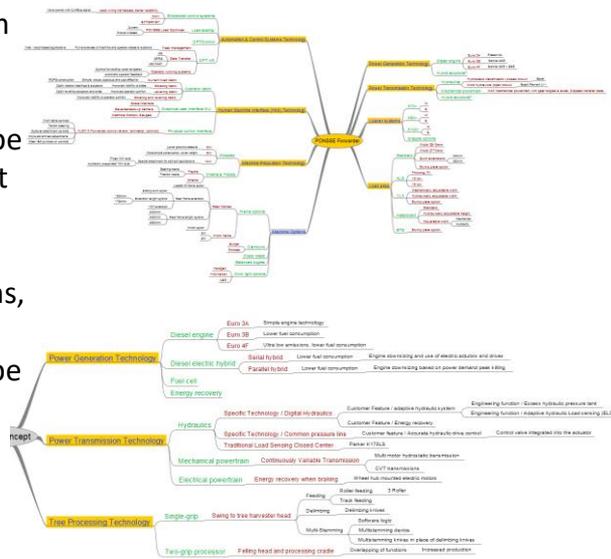
Describes the properties of a product or feature and the list under each of these features, list all the potential options for that property. Teams discuss combinations of options for grouping alternatives to discover new ways for designing the outcome. An example of a morphological box a utility vehicle would look like this:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
1	Modularity of the New Harvester Concept and present other PONSSE product offering - Morphological Box																		
2	Engine	Rear Frame	Front Frame	Frame Lock	Middle Zone	Frame Base	Crane	Harvester Head	Substr. Cabinet	Front Axle/Drive Setup	Rear Axle/Drive Setup	Engine Hood	Cooling Setup	Hydraulic Tank	Hydrostatic Drive Transmission	Mark Hydraulic pump	Control system	Electric system	
3	5014V	ElephantKing	ElephantKing	Mechanical	ElephantKing	Formalizer base	C33	H5	25Ton	NMF P040	NMF P040	4-Cyl	ElephantKing	ElephantKing	ElephantKing	MS-co	ElephantKing	ElephantKing	
4	2514V	ButabKing	ButabKing	Hydraulic	ButabKing	Formalizer base	C35	H6	32Ton	NMF P071	NMF P071	4-Cyl	ButabKing	ButabKing	ButabKing	MS-co	ButabKing	ButabKing	
5	28014V	El	El	New	El	Formalizer 95 base	C2	H7	New	P083	P083	New	El	El	El	New	El	El	
6	New	Visent	Visent	Visent	Visent	Harvester 99 base	C4	H8	New	P094	P094	Visent	Visent	Visent	Visent	Visent	Visent	Visent	
7		Gaselle	Gaselle		Gaselle	New	C5	H9	New	New	New	Gaselle	Gaselle	Gaselle	Gaselle	Gaselle	Gaselle	Gaselle	
8		Bear	Bear		Bear	New	C22	New				Bear	Bear	Bear	Bear	Bear	Bear	Bear	
9		Ego	Ego		Ego	New	C44					Ego	Ego	Ego	Ego	Ego	Ego	Ego	
10		Fox	Fox		Fox	New						Fox	Fox	Fox	Fox	Fox	Fox	Fox	
11		Beaver	Beaver		Beaver	New						Beaver	Beaver	Beaver	Beaver	Beaver	Beaver	Beaver	
12		New	New		New	New						New	New	New	New	New	New	New	
13																			
14																			

Options are identified by combining choices for each feature. The set of design characteristics is identified as a potential design alternative.

Innovation methodology: Mind Mapping

A mind map is a diagram used to illustrate how concepts are related to each other. They describe a visual relationship that can be used to organize information, solve problems make decisions, or structure and classify items. Mind maps can be used to describe the relationships between design functions.



Innovation methodology: TRIZ – 1

Teorija Rezhenija Izobretatelskih Zadach (TRIZ)

- **What is it?** A structured method to develop inventive approaches to technical problems that resolve a key conflict between critical performance elements.
- **How to use it?** TRIZ can be used to reduce time in the invention process and generate opportunities for new applications of basic engineering principles.
- **How to read and interpret it?** TRIZ creates options to be analyzed further for performance implications as compared to requirements.
- **What questions to ask?** How does this idea work in practice, as compared to theory?
- **What are the next steps?** The next steps are design, verification (of the application) and validation that it meets the requirement in the targeted environment.

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Innovation methodology: TRIZ – 2

How does TRIZ work?

TRIZ is a systematic approach to developing innovative solutions.



TRIZ is a methodology to generate ideas that can be used to develop solutions; it does not directly resolve the problem. TRIZ provides the approach by which a problem can be more clearly understood and through which a design team may gain new insights and directions to pursue that result in problem resolution. TRIZ asks new questions like: What is the difference between good and bad ideas, solutions and products? What are the good and bad features of this component or operation? What gets better and what gets worse, if we leave this out? A good idea will resolve contradictions, increase the 'ideality' of the system and use idle, easily available resources to resolve a conflict. Bad ideas create conflicts and inhibit the performance desired by the product's customer.

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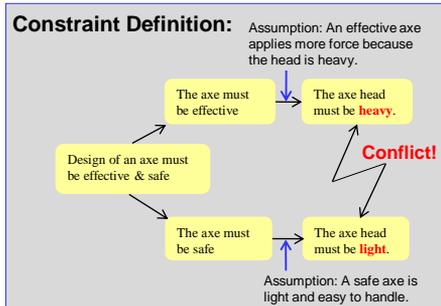
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TRIZ at Fiskars: Case study of disciplined innovation



Systematic innovation using TRIZ:

Innovation focused on human factors and ergonomic design.
TRIZ applied to create new perspectives for technical design options.
Product totally redesigned the classic iron-headed, wood handle axe.



TRIZ Inventive Principles Applied:

- Material substitution
 - Composite materials
 - Counterweight
 - Replacement of a mechanical system
 - Use a pneumatic construction
- } Combined

Application of TRIZ Theory in the Design:

- Plastic handle
- Composite material head
- Unified body construction
- Hollow handle to create “ram air” effect

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Technical applications of functional analysis:

If management doesn't get the front-end of the conceptual design right (translation of market features into engineering functions) then it remains accountable for the quality of the product performance in the market. Fortunately, there are some ways that management can improve its decision-making process in specifying product requirements:

The Kano Model:

The Kano Model helps us to understand the motivation for engineers to create functional designs that deliver engineering features based upon a relative degree of attractiveness to the consumer as compared with the design value of alternatives from competitors.

The Pugh Matrix:

The Pugh Matrix helps engineers and managers to make objective competitive comparisons among alternative technologies, design or capabilities when considering how to implement the market features or engineering functions that define the product's capability.

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Technical application of functional analysis:

Translating market features desired by customers (largely originated from quality features that have one-dimensional characteristics) with those contributed from product standards, regulatory requirements, and operational constraints of the organization's business model (largely originating in the "must be" category) with technological and creative innovations (which drive much of the "attractive quality" features) requires effective management to properly specify the engineering functional requirements.

Kano recognized this fact and his original 1984 article described basic approaches to the specification of product features in the two dimensions of satisfied feeling and satisfied performance with basic ranking systems being used for judgment of perceptions.

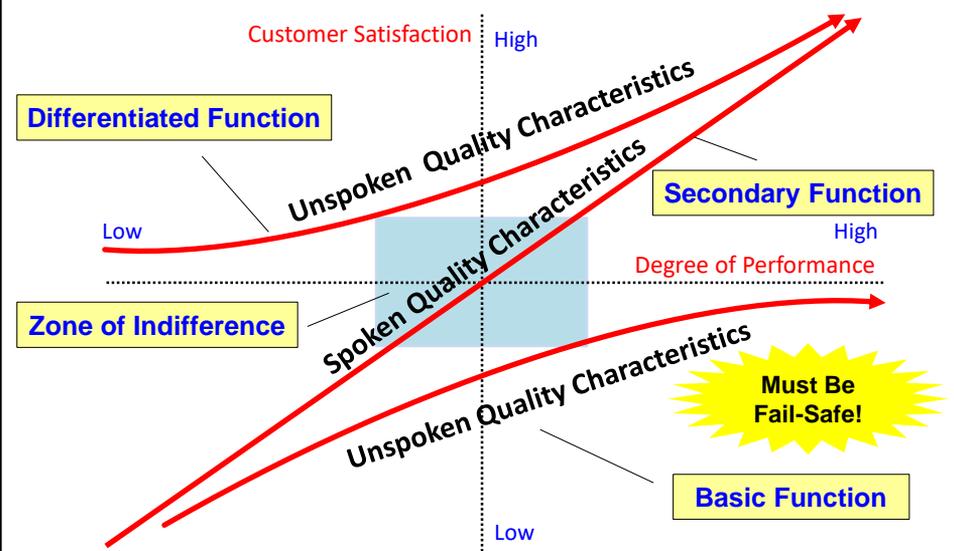
Extension of this model is possible to evaluate features that are targeted to address each of the three categories of quality characteristics. Thus, product features can be assigned a "motivational" category and judged against alternative designs or competing products to determine relative design conceptual superiority or they may be judged against all the product features within a category to allocate resources and judge the level of technical or project risk. This approach may be evaluated using scales that have been calibrated by using the engineering performance of the alternative functional designs.

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Analyzing functional requirements by the Kano Model:



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Priorities for developing new product requirements:

MUST Requirements:

- Identify the function.
- Operationally define critical design parameters.
- Specify the performance measure.
- Determine performance limits, boundaries or desired envelope.

SHOULD Requirements:

- Pinpoint the competitive benchmark for performance.
- Specify the current limits of technical performance.
- Describe any regulatory requirements related to the function.
- Proscribe any safety issues related to the function.
- Identify the engineering or material expert for the function.

Redefining risk categories using the Kano Model:

MOTIVATION – Why include this function in the design? (Kano index)

Innovative (3) - Competitive (5) – Industry Standard (9)

– Who submitted this concept? Use comment identify requirement source

PRIORITY – Consequences to the Customer Experience – Scope

MUST – Technology or Functional Performance – Critical to Current Version – this feature is the minimum for release (9)

SHOULD – Feature or Capability Enhancement – Optional to Current Version (3)

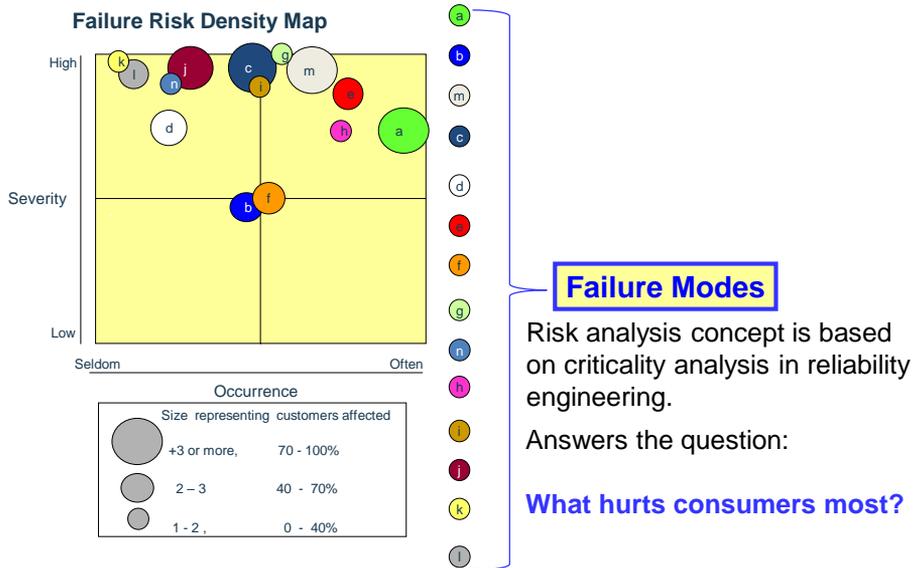
MAY – Elective to Future Version (1)

IDEA – Conceptual for Future Version (0)

CUSTOMER SEVERITY (Viewpoint is what happens if it fails in operations?) (Scale 0 to 9)

RISK LEVEL = Motivation X Priority X Impact [% based on maximum [9 X 9 X 9]

Concept of failure risk density:



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How much risk is embedded into a product feature?

- **High risk factor**
Considering all risks: market, technical, operational
- **Medium risk factor**
Considering all risks: market, technical, operational
- **Low risk factor**
Considering all risks: market, technical, operational



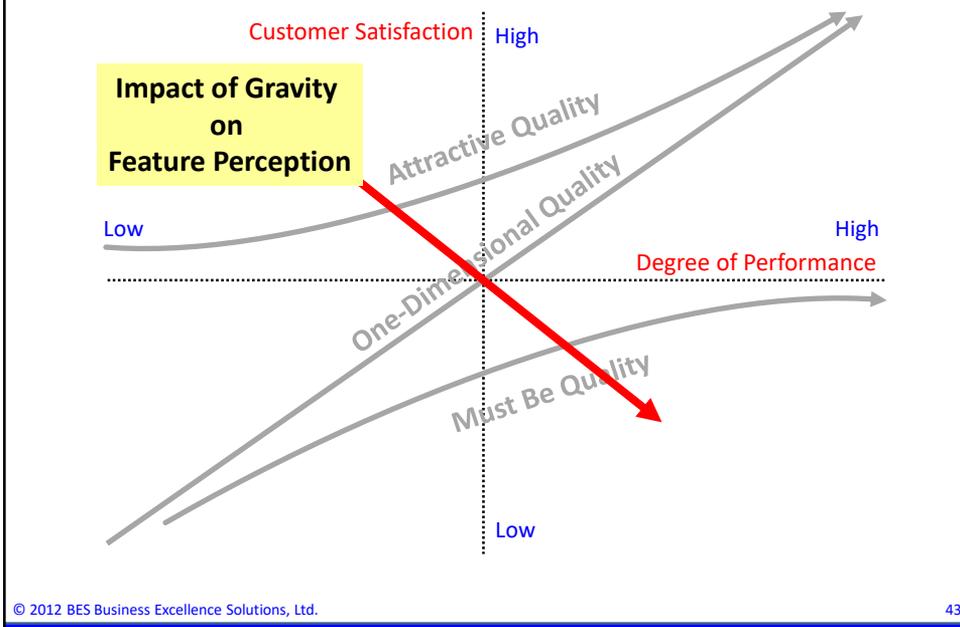
At what time in the product life cycle is the totality of risk eliminated?

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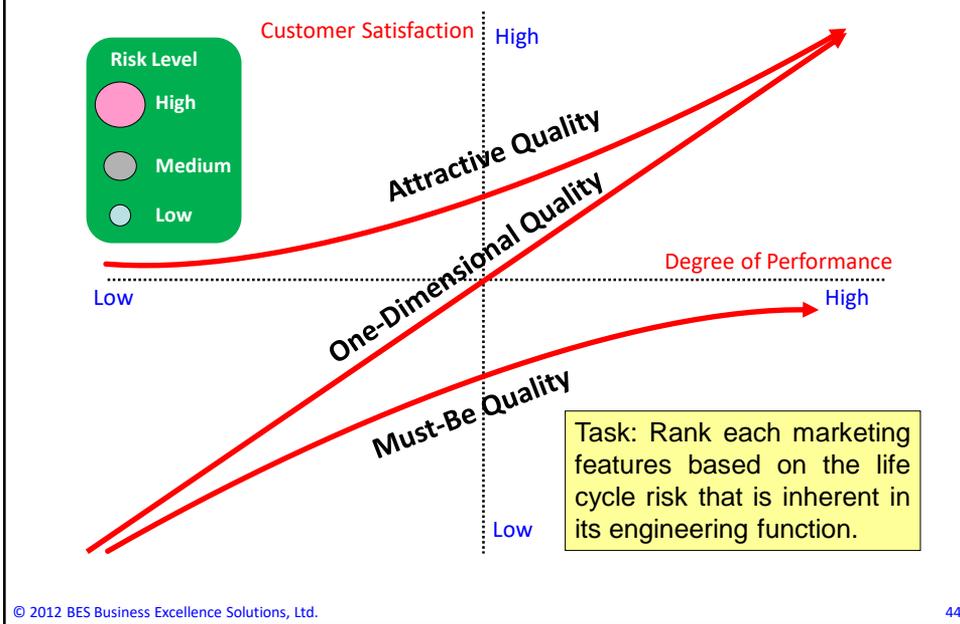
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Kano Requirements Analysis – 1:



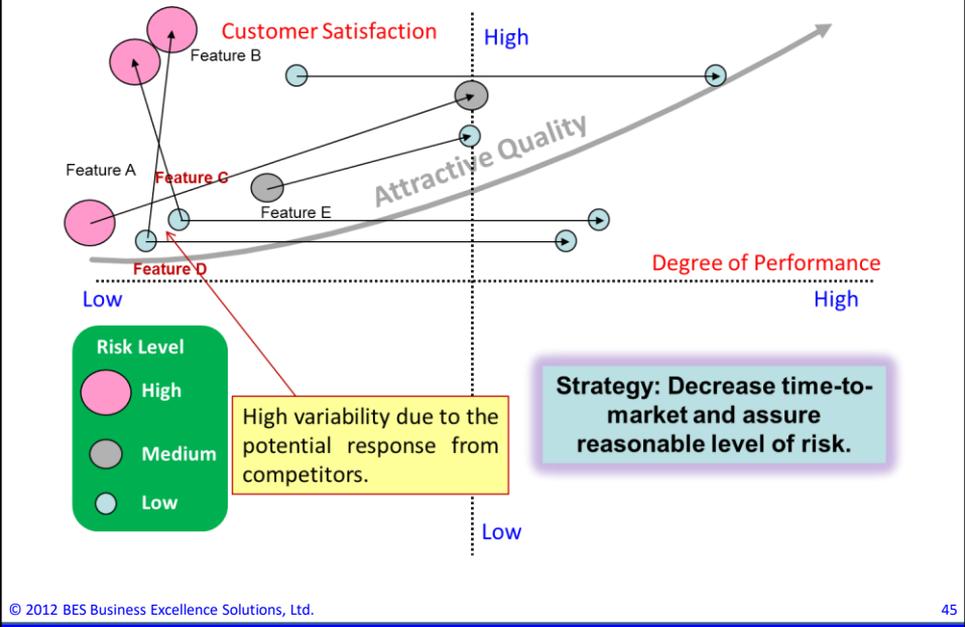
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Kano Requirements Analysis – 2:



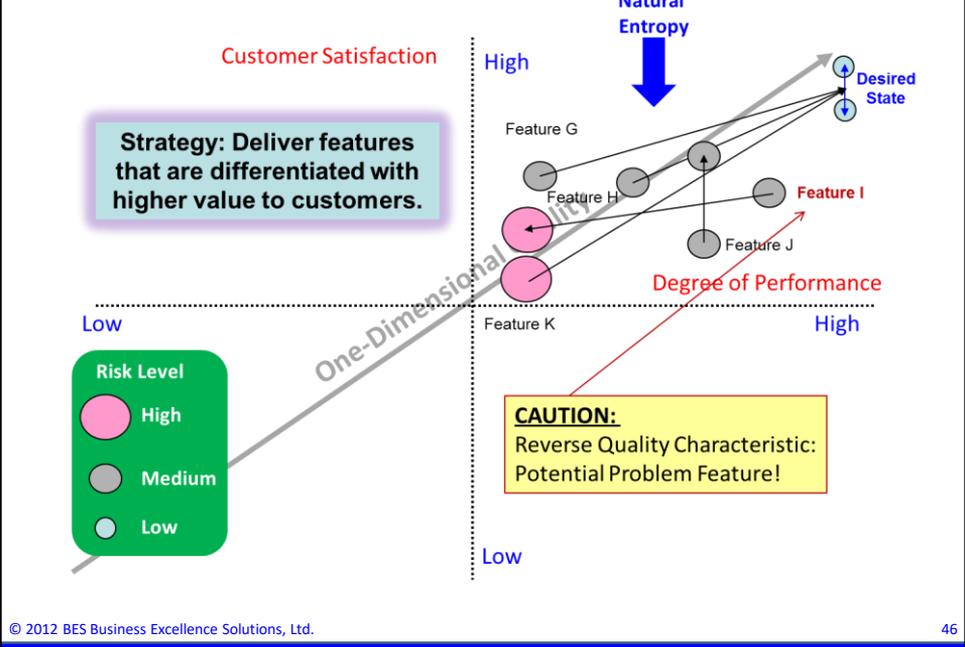
44

Kano Requirements Analysis – 3:



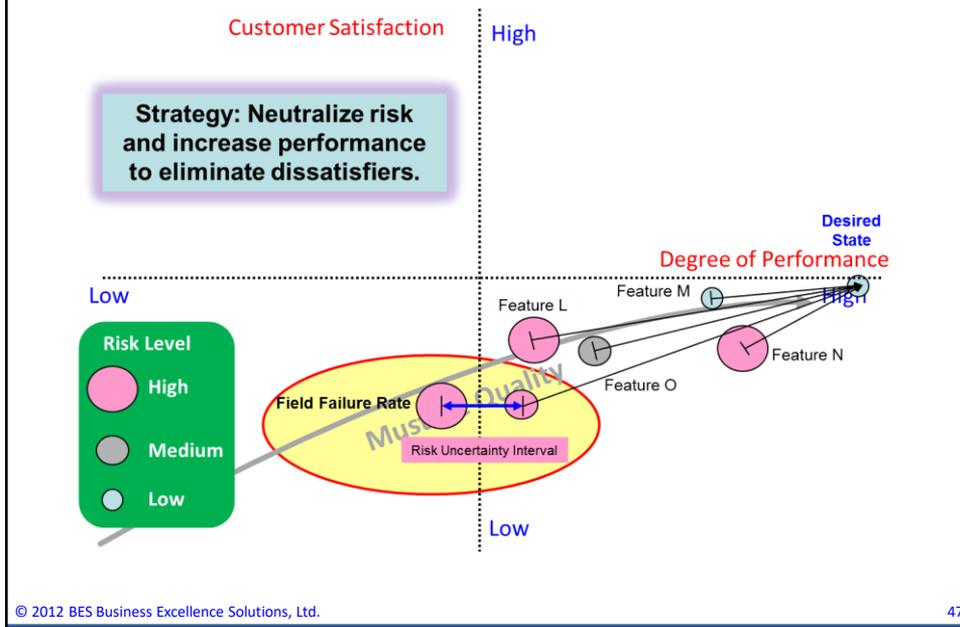
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Kano Requirements Analysis – 4:



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Kano Requirements Analysis – 5:



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Strategic application to competitive analysis:

Strategic insights available by interpreting the Kano Model:

- The Kano Model can be used to describe the motivation for innovation as well as to distinguish between the approaches competing organizations have taken toward innovation in new product development.
- This middle curve in the Kano Model represents the traditional definition of a competitive market as defined by Michael E. Porter (**Competitive Strategy** (1980) and **Competitive Advantage** (1985)). Porter believes that companies must be distinguished either through cost leadership or product differentiation. When focused on a particular market place, the relative merits of competing products may be judged – much as **Consumer's Reports** evaluates alternatives among competing commodities to recommend their buyer's choice or "best of breed" in the Darwinian sense of survival where only the "fittest" survive the tests of time.
- Organizational strategies for competing may be expressed using this model and individual strategies for advancing the technical development of critical product functions can be tied to their life cycle to define technical renewal or revolution that maintains an overall competitive edge.

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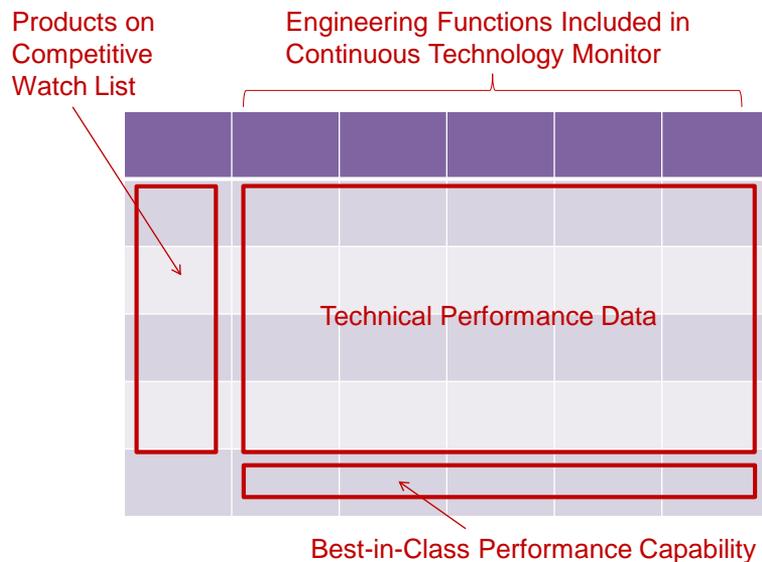
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Innovation methodology: Pugh Matrix – 1

- The **Pugh Concept Selection Matrix** is a prioritization method that is used to rank the relative benefits of design alternatives for an engineering project conceptual design decision. The methodology may be adapted to a variety of similar “weighted” alternative decisions where a comparative baseline may be made.
- The method forces a structured decision on relative performance for a fixed set of criteria where the design options are compared to a baseline design which is either set to a current market leader or the best product design of the own company (in either case, the base comparative product must be in the market.).
- By making comparisons against alternative designs objectivity is encouraged among decision-makers and relative strengths and weaknesses of design options become apparent.
- The solution to the analysis using a Pugh Concept Selection Matrix may be a blending of the design features, rather than choosing a particular winner.

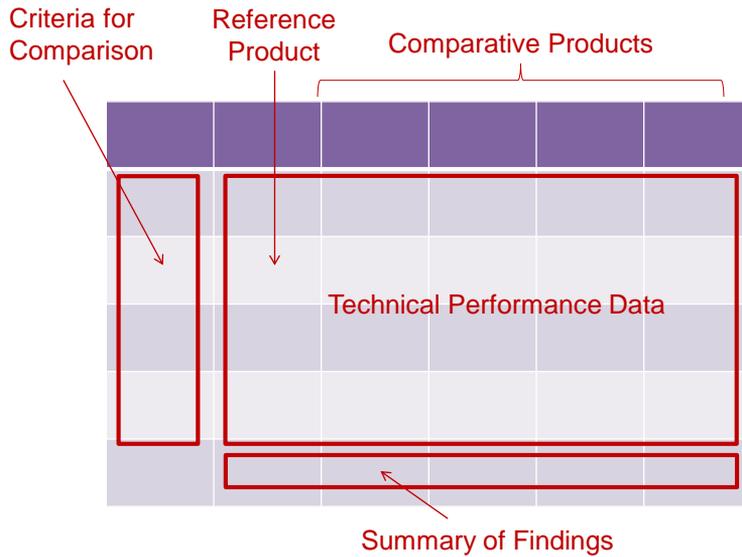
Innovation methodology: Pugh Matrix – 2

Application for comparative function analysis:



Innovation methodology: Pugh Matrix – 3

Application for comparative product analysis:



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Innovation methodology: Pugh Matrix – 4

Examples of application:

- Abstract technology choices
- Alternative marketing strategies
- Alternative feature designs
- Alternative component selection
- Alternative supplier analysis

The Pugh Matrix is to product requirements what an ANOVA Table is to data analysis!

Criteria for Comparison

Reference Product

Comparative Products

Summary of Findings

This is a screenshot of a Pugh Concept Selection Matrix for a watch. The table lists various criteria (e.g., 'Watch strap material', 'Water resistance') and compares them across different watch models. The matrix uses a color-coded system (green, yellow, red) to indicate performance levels relative to the reference product.

This is another screenshot of a Pugh Concept Selection Matrix, showing a different set of criteria and comparative products. It includes a 'Summary of Findings' section at the bottom.

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Concept of risk-leveling in new product design:

- One problem in the development of a “family of new products” is the uneven distribution of technology-based risks across the different product versions.
- Risk-leveling is the process of comparing the levels of relative risk assumed for each of the key product technologies across the generations of the planned product developments.
- Risk at each module is scored using the same scale and high risk developments are limited for each of the sequential product “builds” so no generation of the product bears the full risk of development. If a generation has too much risk, then the designs that create the risk are distributed to the adjacent family products by either “pulling up” or “slipping” their introduction.

Within Product-Model Portfolio Management:

Product Module	Multi-Generational Product Life Cycle Plan							
	A	B	C	D	E	F	G	H
1								
2			↑					
3								
4								
5								
6								
7								

Risk calculated for technology of product module for this release of product.

Example of risk leveling application:

BEFORE RISK LEVELING

Multi-Generation Risk Profile:

(Numbers represent degree of technology risk)

SIX AREAS WITH HIGH RISK TRANSITION = BIG PROBLEM!

	PROD. A	PROD. B	PROD. C	PROD. D	PROD. E	PROD. F
HEADS	1	1	2	2	3	3
MEDIA	12	12	13	14	14	14
MECH BASE	5	5	5	6	6	6
ACTUATOR	3	4	4	5	5	5
SPINDLE	6	6	6	7	7	7
U-PROCESSOR	2	2	2	3	3	3
READ CHANNEL	7	7	7	8	8	9

AFTER RISK LEVELING

Multi-Generation Risk Profile:

Shift technology to balance risk so no generation is risk-limited
(Numbers represent degree of technology risk)

	PROD. A	PROD. B	PROD. C	PROD. D	PROD. E	PROD. F
HEADS	1	1	2	2	3	3
MEDIA	12	12	13	14	14	14
MECH BASE	5	5	5	6	6	6
ACTUATOR	3	4	4	4	5	5
SPINDLE	6	6	6	7	7	7
U-PROCESSOR	2	2	2	2	3	3
READ CHANNEL	7	7	8	8	8	9

NET EFFECT:

No single product release bears an unusual technology risk burden.

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Management reminder:



"In the pursuit of what is new and different, we not must loose sight of what is wise and important."

~ Gregory H. Watson

Must innovation always mean "new" or "different"?

In the pursuit of what is new and different we must not lose the focus on what is wise and important.

Innovation must be systematically managed in order to maintain a focus on delivering attractive quality – remember: requirements for continuous innovation are too important to be left to chance!

Engineers must design an actual entity based on the customer insight gained through observation of their experience.

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Thank you! Any questions?

BUSINESS EXCELLENCE SOLUTIONS





Part 3: Competence Development

BUSINESS EXCELLENCE SOLUTIONS



1

Knowing “when to do” is as important as “what to do”!



Miyamoto Musashi (1584-1645)

“To know the times’ means to know the enemy’s disposition in battle. Knowing the times means, if your ability is high, seeing right into things. If you are thoroughly conversant with strategy, you will recognize the enemy’s intentions and thus have many opportunities to win.”

Miyamoto Musashi
A Book of Five Rings

2

The purpose of education is to accelerate experience!

"I believe that education is a process of living and not a preparation for future living."

~ John Dewey, *My Pedagogic Creed*, 1897

"In education, no work should be done for the sake of the thing done, but for the sake of the growing mind."

~ Francis W. Parker, *The Practical Teacher*, 1984

"There are no uneducated people; only most people are educated wrong. The true task of culture today is not a task of expansion, but one of selection-and-rejection. The educationist must find a creed and teach it."

~ Gilbert K. Chesterton, *What's Wrong With the World*, 1910

Summary:

Competence Development:

Core competence comes from the collaborative work of individuals who pursue a disciplined approach toward a common purpose.

Organizational learning must be structured through the practice of the triple-loop learning process.

Personal competence is achieved by a mastery of knowledge and skills which supplement the natural aptitude of individuals.

Performing job-based needs assessment is one way to determine what set of skills and body of knowledge are required for performance of the specific tasks involved in a job.

Conducting a skills inventory allows managers to create development plans to advance the competence of specific individuals.

Forces Driving Leadership through Quality:



- Part 1: Managing for Quality by Design
- Part 2: Innovation Stimulation
- **Part 3: Competence Development**
- Part 4: Customer Insight
- Part 5: Systems for Quality Development



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Topics related to competence development:



- Understanding Competence
- Competence Development Models
- Processes of Learning and Quality
- The Nature of Knowledge
- Observations on Learning
- Setting Competence Requirements
- Gaining Competence in Innovation

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UNDERSTANDING COMPETENCE

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Topics in competence development and learning:

Everyone is a learner – everyone is a teacher:

- **Gordon Model** – a learning model that describes the four psychological of an individual as they progress through the process of mastering a skill.
- **Dreyfus Model** – a model of skill acquisition that identifies how students gain skills through a combination of formal classroom instruction and real-world practice. Individuals move from rigid adherence to rules to a level of intuitive reasoning based on tacit understanding leading to innovation.
- **Argyris Action Learning Model** – study of how human beings design their actions in difficult situations to achieve the intended consequences and to learn about the variables that govern the pursuit of this knowledge (triple-loop learning process). This learning occurs in an educational process where participants study their own actions and experience and experiment in small working groups as a means to improve performance.
- **Dunning-Kruger Effect** – a state of perception or a cognitive bias in which an unskilled individual suffers from an illusory sense of superiority where they rate their ability to perform as higher than average.

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Establishing foundations for discover – 1:

Definitions of Key Terms:

- **Growth:** increasing performance by applying more of the same effort that has previously occurred (e.g., natural growth in stature).
- **Development:** transforming the way effort has been applied in the past (e.g., exercising to create a new physical capacity that changes stature).
- **Insanity:** doing the same things that we've always done and expecting a different outcome (Albert Einstein: "doing the same thing over and over and expecting a different result.").
- **Knowing:** a process of evaluating hypotheses by the active manipulation of the environment to reformulate understanding of the observations and then re-adapt to the environment so that human action can proceed (see John Dewey (1949) *Knowing and the Known*). Intelligent inquiry is a process of continuity in investigation coupled with adaptive response to learning.
- **Known:** an object of the process of knowledge which exists in a continuing state of revelation as the knowing process becomes more certain.
- **Experience:** a direct observation of the senses or the participation in an event as the basis for formulation of knowledge.

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Establishing foundations for discovery – 2:

Definitions of Key Terms (continued):

- **Fact:** ("*verum factum*", truth in fact, defined by Giovanni Battista Vico) a fact refers to something that occurred in reality or is actually verifiable, provable to correspond to experience. Scientific facts are verified to a high probability in repeatable experiments. Karl Popper held empirical falsification is the standard used to judge scientific statements. Popper believed scientific theory is abstract in nature and it must be falsifiable: if it is false it can be shown by experiment or observation to be false.
- **Actual Entity:** Alfred North Whitehead identified actual entities as clusters of things that shape reality. Immanuel Kant called this the "*ding an sich*" or "thing in itself" rather than a phenomenon (perception of the object).
- **Questioning:** a disciplined inquiry process to explore ideas directed at the pursuit of truth by: defining issues, exposing logic and assumptions, discerning what is known from what is unknown, or controlling discussion by focusing on vital theories, principles, issues, etc. as in a Socratic dialog.
- **Structured Inquiry:** a process of inquiry whereby the problem is defined as well as the method or set of questions that are used for questioning. The outcome is generalized from the observations collected.

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Establishing foundations for discovery – 3:

Definitions of Key Terms (continued):

- **Problem Solving:** a process to close the gap between the current state and the desired state of performance of a product, process or service. This will involve determination of potential cause, analysis to determine root cause and potential solutions, experimentation to confirm solutions achieve the desired results and action planning to treat or implement the change.
- **Appreciative Inquiry:** A process to value and exploit what the organization already does with exceptional results, engaging in an organization-wide dialog to envisioning what the future could be and where improvements are available and then innovating to create what will be.
- **Experiment:** a methodical process of testing where the inputs are varied in a planned manner to determine the validity of an hypothesis regarding their relationship to an output.
- **Hypothesis:** A proposed theoretical explanation for the relationship of two or more phenomenon. The null hypothesis is that there is no explanation of variation between the inputs and outputs of an experiment and when it is falsified to a high probability, then the alternative hypothesis is validated. In the scientific method a hypothesis must be testable.

Establishing foundations for discovery – 4:

Definitions of Key Terms (continued):

- **Observation:** the act of receiving external knowledge from the senses as human sensory observations or as data that is collected through scientific instruments.
- **Perception:** the interpretation of sensory information in order to develop a subjective mental model of its meaning.
- **Feedback:** a process by which information about past performance is used to influence or modify the subsequent performance of a reference system.
- **Insight:** the understanding of a cause and effect relationship that exists in a specific circumstance or situation. Insight is developed through a process of introspection supported by acute observation, deductive logic, and the perception of the observer. This understanding may also be based on the theoretical relationship or behavior of a particular model or set of rules.
- **Capacity:** a measure of the ability of a process or system to produce a maximum volume of output (e.g., as in capacity utilization which defines the difference between the actual output that is produced to the potential output that could be produced if the equipment were operated at it full level of performance). Capacity answers the question: “how much?”

Establishing foundations for discovery – 5:

Definitions of Key Terms (continued):

- **Aptitude:** a component of competence that indicates the natural talent or inherent ability to perform a certain kind of work. Aptitude may be either physical or mental, but it does not include knowledge, understanding, learned or acquired abilities (e.g., skills) or attitude. It is also different from achievement which represents knowledge that has been gained to some degree of competence.
- **Skill:** a learned capacity to perform a specific task to some level of ability or performance criteria. Skills may be specific to a particular discipline or task or general (e.g., time management, teamwork, etc.)
- **Knowledge:** theoretical and practical understanding of a subject which includes, facts, descriptions, and skills that are gained through education or experience.
- **Capability:** the ability to perform an action or activity to some degree or level of compliance with a standard or specification. In humans it is the combination of expertise and capability.

Competence development for people & organizations:

Lawrence J. Peter (1919-1988): *The Peter Principle* (1969):
“Equal opportunity means everyone will have a fair chance at being incompetent.”

We must design a process for becoming unconsciously competent:

- **Competence (kom'-pe-tens)** (n.): A state or quality of being adequately or well qualified; ability. A specific range of skill, knowledge, or ability. [*The American Heritage Dictionary* (2012)]
- **We desire more than “adequate ability” when we seek competence. It is implied that we seek a level of “mastery” for the subject.**
- **Competence:** A cluster of related abilities, commitments, knowledge, and skills that enable a person (or an organization) to act effectively in a job or situation. Competence indicates sufficiency of knowledge and skills that enable someone to act in a wide variety of situations. [*The Business Dictionary* (2012)]
- **The question is how to develop this cluster of learning within people and organizations?**

“Core competence” of the corporation*

Core competence enables “sustainable” competitive advantage:

- Core competence is the collective learning of the organization by which it creates a foundation from which competitive advantage is created.
- Core competence creates possibilities for the future, so they are strategic.
- Three characteristics of a core competence:
 1. Provides potential access to a wide variety of markets
 2. Increases perceived customer benefits, and
 3. Is hard for competitors to imitate.
- Capabilities are considered core if they are fundamental strengths of the firm and they differentiate a company strategically.

* C. K. Prahalad and Gary Hamel (1990), “The Core Competence of the Corporation,” *Harvard Business Review*, 68:3, pp. 79-91.

Beware of the downside of core competence:

When competence becomes institutionalized it is in danger of stagnation!

- Whenever competence is tied to a particular academic discipline and that discipline is viewed as the competitive advantage, then that discipline will dominate the organization’s thinking and logical processes. When this is the situation, organizations will tend to reinforce the methods of that one discipline over all others and give preference to individuals included in the community of that discipline for personnel actions (e.g., hiring, promotion, selection for advanced education, etc.).
- These are indicators that the organization has translated core competence into a core rigidity that inhibits its innovative process and limited the way it considers new alternatives as it has become fixated in its “**gestalt**” or the pattern in world view by which it interprets information. Such fixation is a generator of myopia (shortsightedness or the inability to see clearly at a distance – lack of farsightedness) thereby causing organizations to ignore opportunities and this will effectively hide potential design alternatives from being discovered.

Learning imperative: Create a quality mindset!

An attitude of quality is demonstrated in these behaviors:

- Collaboration and cooperation showing respect for individuals
- Clear communication – with intent to clarify (fair, equitable, even-handed treatment)
- Ethics, honesty, integrity of information (our words are authentic and say what we mean)
- Etiquette and respect for behavioral norms
- Broad systems perspective
- Transparency, openness to consider options and alternatives regarding issues and concerns
- **Summary: Flexibility and moderation**

Such inclusiveness promotes organizational harmony as well as rationalization of work and alignment of objectives.

Dorothy Leonard-Barton, "Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development" *Strategic Management Journal*, 1992, Vo. 13, No. 5., pp. 111-125.

Learning imperative: Avoid a deficit in quality mindset!

Lack of quality is demonstrated in the opposite behaviors:

- Divisive, aggressive behavior demonstrating disrespect for individuals
- Prejudiced communication with an intent to obscure (unfair, inequitable, biased treatment)
- Extreme positions, fueled with inaccurate information, and purposeful misinterpretations
- Disrespect for behavioral norms – attacking others
- Narrow, single-purposed perspectives
- Vague, opaque, closed viewpoints and positions on issues and concerns
- **Summary: Rigidity and extremism**

Therefore, management needs a structured learning process to assure that its capacity to innovate is not limited.

Dorothy Leonard-Barton, "Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development" *Strategic Management Journal*, 1992, Vo. 13, No. 5., pp. 111-125.



COMPETENCE DEVELOPMENT MODELS

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Perception is the way to gain understanding:

Science is built upon experimental observation:

“There remains simple experience; which, if taken as it comes, is called accident, if sought for, experiment. The true method of experience first lights the candle [hypothesis], and then by means of the candle shows the way [arranges and delimits the experiment]; commencing as it does with experience duly ordered and digested, not bungling or erratic, and from it deducing axioms [theories], and from established axioms again new experiments.”
~ Francis Bacon. **Novum Organum** (1620)

Observation is captured through sensual perception:

Maurice Merleau-Ponty (1908-1961) in **Phenomenology of Perception** (1945) broke the dualism of rationalism-empiricism and emphasized the role of perception to develop understanding and world knowledge. As he described it, the body, rather than mental consciousness is the source of perceptual observation therefore it creates knowledge. His ideas were highly influenced by psychology and cognitive science. Edmund Husserl (1859-1938) had taught (**Cartesian Meditations** 1931) that we must “bracket” (e.g., suspend or set aside pre-existing belief and prejudice to make more objective judgments) our subjective self with its biases as perceiver to more profoundly observe experience from an objective perspective.

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Appreciative inquiry process to develop knowledge:*

The Master said, "Shall I teach you what knowledge is? When you know a thing, to hold that you know it; and when you do not know a thing, to allow that you do not know it; this is knowledge."
 ~ Confucius (500 BC), *Analects*

Understanding the conditions of knowledge:

	State of Known	
State of Knowing	Known Known	Known Unknown
	Unknown Known	Unknown Unknown

Employ a "4D" Appreciative Inquiry Process to:

- **Discover** the "best of what is"— identify where processes worked perfectly.
- **Dream** "what might be"—envisioned processes that always work perfectly.
- **Design** "what should be"—define the elements of perfect processes.
- Create a **Destiny** based on "what will be"—participate in creating the design.

* Cooperrider, D. L., Whitney, D., & Stavros, J. M. (2003). *Appreciative inquiry handbook* (Bedford Heights, OH: Lakeshore Publishers).

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Gordon Model of Competence Development:*

Consciousness of the level of skill mastery in competence attainment: The of competence model represents progress made moving from incompetence to competence in a skill. People develop competence only after they recognize the relevance of their own incompetence in the skill concerned.

The four stages of building competence in a new skill:

1. Unconscious incompetence:

The individual does not understand or know how to do something and does not necessarily recognize the deficit. They may deny the usefulness of the skill.

2. Conscious incompetence:

Though the individual does not understand or know how to do something, he or she does recognize the deficit, as well as the value of the new skill.

3. Conscious competence:

The individual understands or knows how to do something. However, it requires concentration and the individual is consciously aware of executing the new skill.

4. Unconscious competence:

The individual has had so much practice with a skill that it has become "second nature" and can be performed easily. As a result, the skill can be performed while executing other tasks.

* <http://www.gordontraining.com/>

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Dreyfus Model for Levels of Competence Development:

1. **Novice:** rigidly adheres to rules with no exercise of discretion or judgment.
2. **Advanced beginner:** limited situational awareness; treats work equally.
3. **Competent:** copes with complexity, multi-tasking; relates actions to goals; prepares deliberate plans and formulates routine or standard work.
4. **Proficient:** prioritizes activities based on perceived deviations from normal situations and manages with situational awareness.
5. **Expert:** transcends reliance on rules and guidelines; has an intuitive grasp with tacit understanding and a vision of what is possible; uses analytical approaches in new situations or problem cases.

Stuart E. Dreyfus, and Hubert L. Dreyfus (1980), *A Five-Stage Model of the Mental Activities Involved in Directed Skill Acquisition*, Washington, DC: US Department of Defense.

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Experiential Learning Model (ELM):*

Learning consists in a spiral of four inter-related elements:

A process of developing meaning from direct experience – we learn by doing.

To gain genuine knowledge from an experience, learners must be:

- Willingly and actively involved in the experience;
- Possess ability to objectively reflect on the experience;
- Possess analytical skills to conceptualize the experience; and
- Possess decision making and problem solving skills apply the new ideas

The process of learning is a continuum that may be entered at any of its four stages, but it usually follows the order: concrete experience; observation of and reflection on that experience; formation of abstract concepts based upon the reflection; and testing the new concepts.

* Based on ideas derived from John Dewey, Jean Piaget and Kurt Lewin.

References:

David A. Kolb and Ronald Fry (1975), "Toward an applied theory of experiential learning," in C. Cooper (ed.), *Theories of Group Process* (London: John Wiley).

David A. Kolb (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.

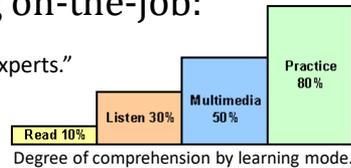
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Action Learning – action learning on-the-job:

“The key to learning lies with practitioners, not with experts.”
~ Reginald W. Revans*



Components of Action Learning:

1. An urgent and significant problem assigned to a team to resolve.
2. A diverse team of 4-8 people who work on a problem that has no easily identifiable solution.
3. A process of insightful questioning and reflective listening that is built on group dialog and cohesive transparency to generate innovative solutions by using systems thinking.
4. Group is delegated decision rights to take action taken on the problem
5. Members are committed to learning while working on a short-term issue they build strategic value to the organization through increased competence.
6. The team coach facilitates the learning and enables people to concentrate on their communications methods and team decision-making processes.

“I hear and I forget; I see and I remember; I do and I understand.” ~ Confucius

© 2012 BES Business Excellence Solutions, Ltd. * R. W. Revans (1966). *The Theory of Practice in Management* (London: Macdonald).

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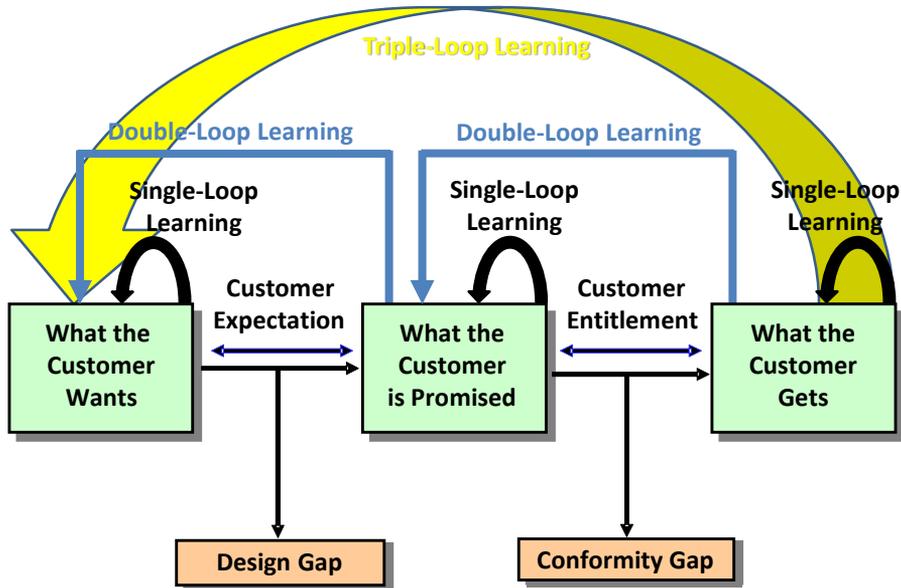
PROCESSES OF LEARNING AND QUALITY

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Quality Delivery Model & Triple Loop Learning *



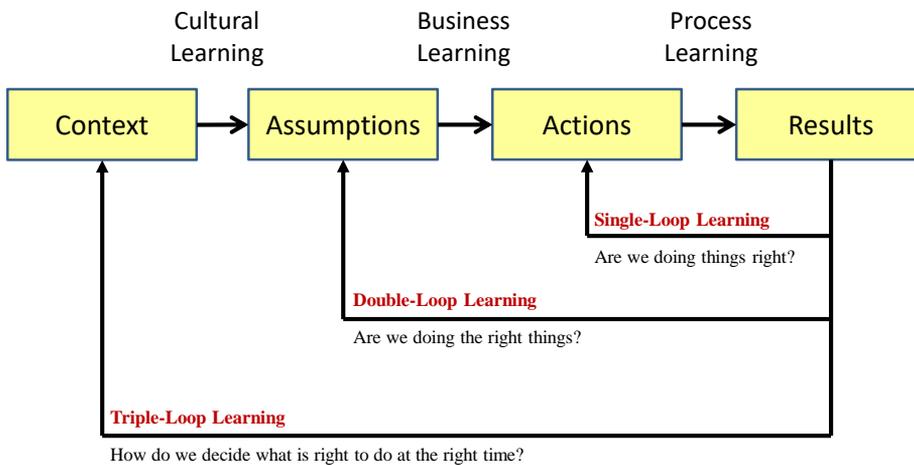
© 2012 BES Business Excellence Solutions, Ltd. * More on this topic in the section on managing for quality by design.

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To build core competence, we must learn how to learn:

Triple Loop Learning:



Chris Argyris and Donald A. Schön (1978), *Organizational Learning: A Theory of Action Perspective* (Reading, MA: Addison-Wesley).

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Dynamics of structured learning – 1:

Triple Loop Learning: First Loop – Solving the Immediate Problem

Definition: Harvard psychologist Chris Argyus defined “single-loop learning” as the ‘detection and correction of errors’ or learning what to do.

Process Elements of Single-Loop Learning:

- Document the current standard work process.
- Instill discipline of work process measurement.
- Assure quality review of work outcomes or products.
- Implement corrections to assure standard results.
- Design preventive action to eliminate future problems.
- Change the standard work definition to assure quality.

Aspects of “single-loop” learning:



- **Who:** all process workers at all levels of organization.
- **What:** standardization, problem-solving and process improvement
- **When:** daily work process execution
- **Where:** an integrated system applying to all work processes
- **How:** work standards, problem-solving methods and continuous process improvement methods (e.g., ISO9000, Lean, LSS DMAIC)
- **How much:** eliminate waste and defects in all processes.

Dynamics of structured learning – 2:

*Triple Loop Learning: **Second Loop** – The Improvement Process*

Definition: “Double-loop learning” occurs by ‘questioning the system of learning’ resulting in correction of underlying principles, theories, policies of the organization or implementing insights for change that were identified in the detection and correction process.

Process Elements of Double-Loop Learning:

- Developing a standard problem-solving process.
- Developing a standard for risk and failure analysis.
- Developing a standard performance measurement system.
- Developing a standard processes for change management.

Aspects of “double-loop” learning:



- **Who:** professional staff for project business process management
- **What:** develop and improve standard for single-loop processes
- **When:** review regularly (quarterly, bi-annually, annually)
- **Where:** centralized function for standards; distributed for inputs
- **How:** reviewing lessons learned, best practice and failed projects
- **How much:** Strive to increase project performance effectiveness

Dynamics of structured learning – 3:

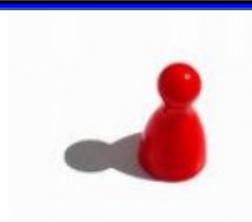
*Triple Loop Learning: **Third Loop** – Charting Strategic Change*

Definition: “Triple-loop learning” – learning what we need to learn – learning how to learn differently – permanent learning that changes the way people work at the institutional or cultural level because the change masters have the power to mandate the new processes!

Process Elements of Triple-Loop Learning:

Thus, single loop learning occurs during problem-solving while double-loop learning occurs during management review of improvement projects by integrating lessons into the organization. Triple loop learning occurs through reflective review of change management efforts and by identifying insights into new knowledge for adaptation into the organization’s culture.

Aspects of “triple-loop” learning:



- **Who:** executive management team supported by quality leaders
- **What:** focus on developing an organizational process for change
- **When:** review annually as a prelude to strategic planning
- **Where:** orchestrated management meeting
- **How:** self-assessment of maturity and identify projects to improve
- **How much:** Strive to permit process capability to achieve strategic intent



THE NATURE OF KNOWLEDGE

Pursue knowledge to obtain wisdom ...



“Wisdom is the principal thing; therefore get wisdom; and with all thy getting get understanding.”

~ **The Bible**, Proverbs 4:7

“Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?”

~ T. S. Eliot, **The Rock** (1934)

“Knowledge is information that changes something or somebody — either by becoming grounds for actions, or by making an individual (or an institution) capable of different or more effective action.”

~ Peter F. Drucker
The New Realities (2003)

Dunning-Kruger Effect: Cognitive Bias

Incompetence masks our ability to understand that we are incompetent:

- This bias is created by a cognitive inability of unskilled people to recognize their own mistakes. The Dunning-Kruger Effect states that incompetence masks our ability to recognize our incompetence. Actual competence weakens self-confidence, because competent people may falsely assume that others have an equivalent understanding.
- Kruger and Dunning conclude: “the miscalibration of the incompetent stems from an error about the self, whereas the miscalibration of the highly competent stems from an error about others.”
- “When people are incompetent in the strategies they adopt to achieve success and satisfaction, they suffer a dual burden: Not only do they reach erroneous conclusions and make unfortunate choices, but their incompetence robs them of the ability to realize it. Instead, they are left with the erroneous impression they are doing just fine.”

* Justin Kruger and David Dunning, “Unskilled and Unaware of It: How Difficulties of Recognizing One’s Own Incompetence Lead to Inflated Self-assessments,” *Journal of Personality and Social Psychology*, 1999, vol. 77, no. 6, pp. 1121-1134.

Determining what is knowable in the known:

Considerations in developing a structured approach to learning:

- First, we must understand **what is knowable** with respect to the subject.
Chester I. Barnard (1886-1960) – Levels of Knowledge Discovery
The level of discovery available is determined by the actual entity studied.
- Second, we must understand **how well observations may be interpreted.**
Stanley S. Stevens (1906-1973) – Theory of Scales of Measurement
The measurement system used for observations limits appropriate use of statistical tools for analytics.
- Third, we must understand **what must be done with the knowledge.**
Benjamin S. Bloom (1913-1999) – Taxonomy of Cognition
The utility of observations is limited by the degree of cognition that the observer perceives as necessary for knowledge application.

Not all knowledge can be known with equal authority:

There are distinct categories of facts that bias proposed problem solutions. We can observe facts using one perspective (e.g., physical), but interpret it using a different perspective (e.g., political). Thus, “managing by facts” may become distorted due to a subjective manipulation by those who lack a shared perspective.

Limitations of Knowledge – what can we know with confidence?

Type of Data	Explanation of Data	Nature of Data
Physical data	Continuous variables (engineering quality data)	Tangible ↓ Less Tangible ↓
Biological data	Ergonomic data (time and motion)	
Process data	Timing and attribute data (pass/fail compared to criteria)	
Economic data	Approximations (estimates based on probability forecast)	More Intangible ↓ Intangible
Political data	Leadership and strength of relationship (fixed scale/rank)	
Social data	Interactions or relationship (group norm relativity)	
Moral data	Values or personal philosophy (individual relativity)	

Chester I. Barnard, *Functions of the Executive* (Boston: Harvard, 1936).

Theory of the scales of measurement:

Limitations of Knowledge – do our analytics distort the facts we observe?

Scale	Empirical Operations	Mathematical Group Structure	Applicable Statistics
Nominal	Determination of equality	Permutation group * $f(X) = \text{one-for-one substitution}$	Frequency count Mode Contingency correlation
Ordinal	Determination of greater than or less than	Isotonic group ** $f(X) = \text{any monotonic increasing function}$	Median Percentiles
Interval	Determination of equality of intervals or differences	General linear group $f(X) = mx + b$	Mean Standard deviation Rank order correlation Product moment correlation
Ratio	Determination of equality of ratios	Similarity group *** $f(X) = ax^1$	Coefficient of variation

* **Permutation group:** a rearrangement of an ordered list so there is one-to-one correspondence with itself (e.g., the different combinations possible for enumerating the order of a deck of cards). The number of permutations is calculated by:

** **Isotonic group:** a function $f(X)$ that always increases as X increases (e.g., the derivative domain is a strict inequality) and thus has an observable order (e.g., as car speed increases gas consumption increases).

*** **Similarity group:** a relationship between two groups where X^1 is similar to X in a constant way (a) (e.g., a relationship automobile gas consumption performance that depends on the size of the engine).

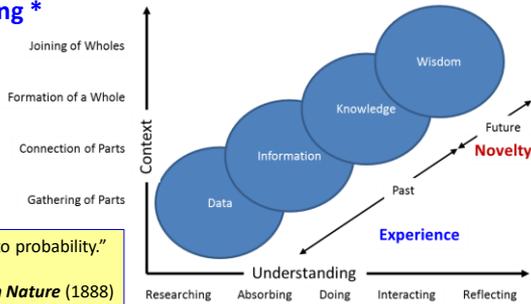
Stanley S. Stevens (1946), On the Theory of Scales of Measurement, *Science*, 103;1584, pp. 677-680.

Some “knowledge” is more certain than others!

DIKW Continuum of Understanding *

Data and information describe the past, while knowledge and wisdom endure into the future. In this continuum meaning of a data observation is increased as new levels of understanding are achieved.

“All knowledge degenerates into probability.”
~ David Hume
A Treatise on Human Nature (1888)



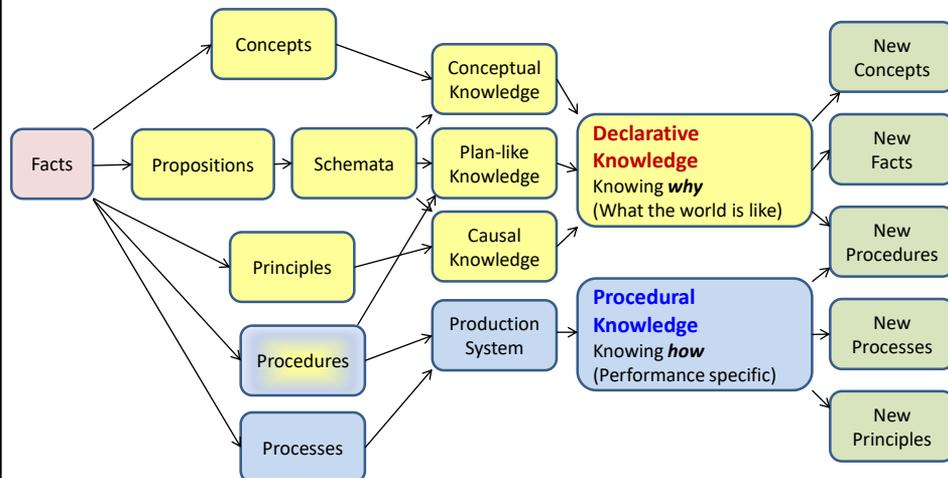
Knowledge is based on experience which is interpreted by perception:

- “Knowledge is the perception of agreement or disagreement of two ideas.” John Locke (“Book IV: Of Knowledge and Probability,” *An Essay: Concerning Human Understanding* (1689)).
- Scientific “certainty” is a probability that enables refinement of logical propositions as new knowledge is gained based on observations from experiments or experience.
- Knowledge develops over time and expands in context, providing a framework with which to evaluate new knowledge and advance understanding.

* Harlan Cleveland (1982), "Information as Resource", *The Futurist*, Vol.16 , No. 12., pp. 34-39.

How goes the pursuit of knowledge? *

The pathway to knowledge requires much learning!



* Ikujiro Nonaka and Hirotaka Takeuchi (1995), *The Knowledge Creating Company* (London: Oxford University Press).



OBSERVATIONS ON LEARNING

How is learning related to knowledge?

Limitations of Knowledge – what do we need to know to get our job done?

Taxonomy of Educational Objectives:

- A body of knowledge represents the knowledge base for competence in a technical field or discipline. There are two aspects of a body of knowledge: the **logically-structured content** that defines what must be known to achieve mastery of this field and the **levels of cognition** to be achieved in the content to achieve performance mastery. To make a judgment about any individual's degree of master of the body of knowledge it is necessary to define the performance criteria and assessment methods to be used in order to assess a person's competence.
- There are six levels of cognition which indicate the intended **complexity level** of the content to be taught in curriculum and provide a structure for competence assessment. These levels are based on "Levels of Cognition" (adapted from the book by Benjamin S. Bloom (1913-1999) **Taxonomy of Educational Objectives** (1956, 1984)) and are ranked according to their relative degree of complexity.

What is the level of performance required?

Levels of Cognition:

- **Knowledge.** Able to *remember* or recognize terminology, definitions, facts, ideas, materials, patterns, sequences, methodologies, principles, etc. (this is also commonly referred to as recognition, recall, or rote knowledge) (*information recognition*).
- **Comprehension.** Able to *read and interpret* descriptions, communications, reports, tables, diagrams, directions, regulations, etc. (*conceptual understanding*).
- **Application.** Able to *use and apply* ideas, procedures, methods, formulas, principles, theories, etc., in job-related situations (*contextual treatment*).
- **Analysis.** Able to break down (*decompose*) information into its constituent parts and recognize the parts' relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario (*construction*).
- **Synthesis.** Able to put parts or elements together (*compose*) in such a way as to show a pattern or structure not clearly there before; identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn (*innovative integration*).
- **Evaluation.** Able to make judgments (*assess*) regarding the value of proposed ideas, solutions, methodologies, etc., by using appropriate criteria or standards to estimate accuracy, effectiveness, economic benefit, etc. (*critical judgment*).

<p>Taxonomy:</p> <p>This application of Bloom's taxonomy was developed to define a proposed body of knowledge for Design for Six Sigma.</p> <p>Gregory H. Watson, <i>Design for Six Sigma</i> (GOALQPC, 2005).</p>	Learning Objective	Cognitive Level	Performance Criteria	Appraisal Method
	Understand Know Recognize Identify	Knowledge - Information Recognition	Describe Item	Personal Reflection Test
	Discuss Document Define Compare Contrast Choose Select Depict	Comprehension - Conceptual Understanding	Distinguish Item	Team Discussion Table Talk Test
	Collect Measure Construct Chart Plot Use Apply Translate Interpret	Application - Contextual Treatment	Interpret Item	Case Study Project Test
	Calculate Determine	Analysis - Decomposition and Construction	Analyze Item	Homework Case Study Exercise Project Test
	Plan Negotiate	Synthesis - Innovative Integration	Facilitate Item	On-the-Job Project Case Study Essay Exercise
	Create Develop	Evaluation - Critical Judgment	Create New Item Design/Modify Item Critique Item Design	Teach Coach Mentor

Learning how we learn – Fleming’s VARK Model:

Individuals have different styles or preferences for the method of learning:



Created by New Zealand educator Neil D. Fleming in 1987, based on neuro-linguistic programming.

- **Visual** – preference for *seeing* (pictures, diagrams, models, etc.)
- **Auditory** – preference for *hearing* (lectures, discussion, tapes, etc.)
- **Read/Write** – preference for *reading or writing* (articles, handouts, exercises, overhead slides, etc.)
- **Kinesthetic** – preference for *moving, touching, or doing* (experiments, on-the-job experience, development projects, etc.)

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Characteristics of learning styles:

What is your dominant learning style?

When you:	Visual	Auditory	Kinesthetic and Tactile
Spell	Do you try to see the word?	Do you try to sound out the word?	Write the word down to find if it feels right?
Talk	Talk sparingly, but dislike listening for too long? Do you favor words like see, picture and imagine?	Enjoy listening but are impatient to talk? Use words such as hear, tune and think?	Gesture and use expressive movements? Use words such as feel, touch and hold?
Visualize	See vivid, detailed pictures?	Think in sounds?	Have few images, all involving movement?
Concentrate	Do you become distracted by untidiness or movement?	Become distracted by sounds or noise?	Become distracted by activity around you?
Meet someone again	Do you forget names but remember faces and where you met?	Forget faces but remember names and what you talked about?	Remember best what you did together?
Contact people on business	Do you prefer direct, face-to-face, personal meetings?	Prefer the telephone?	Talk with them while walking or participating in an activity?
Relax	Do you prefer to watch TV, a play, or a movie?	Prefer to listen to the radio, music or read?	Prefer to play games or work with your hands?
Try to interpret someone's mood	Do you mostly look at their facial expressions?	Listen to the tone of voice?	Watch body language?
Read	Do you like descriptive scenes and pause to imagine the action?	Enjoy dialog and conversation to hear how the characters talk?	Prefer action stories or are not a keen reader?
Do something new at work	Do you like to see demonstrations, diagrams, slides or posters?	Prefer verbal instructions or talking about it with someone else?	Prefer to jump right in and try it?
Put something together	Do you look at the directions and pictures?	Like to talk to someone or find yourself talking out loud as you work?	Ignore the directions and figure it out as you go along?
Need help with a computer application	Do you seek out pictures and diagrams?	Call the help desk, ask a neighbor or growl at the computer?	Keep trying to do it or try it on another computer?
Teach someone	Do you prefer to show them?	Do you prefer to tell them?	Do if for them to let them see how it's done or watch them do it?

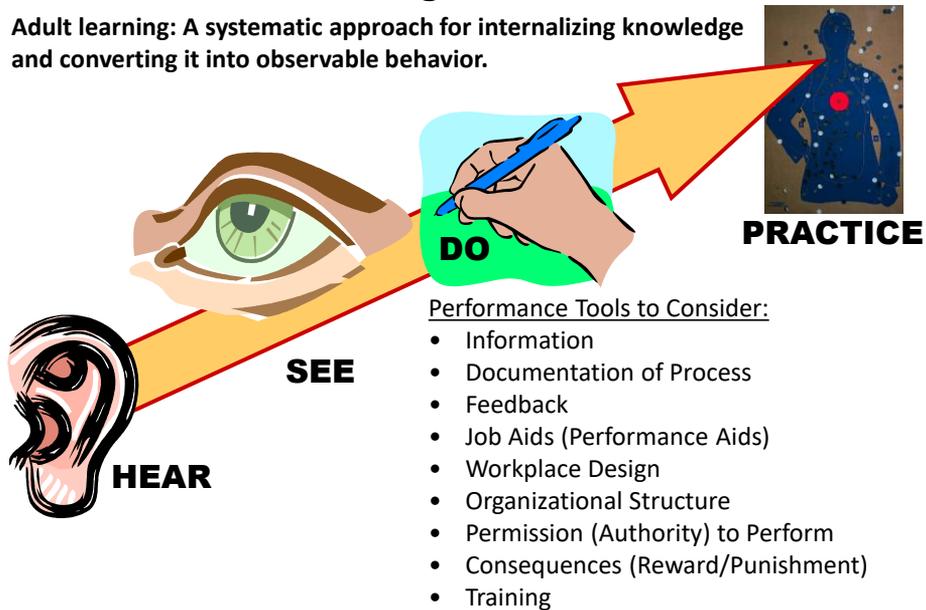
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Process for adult learning:

Adult learning: A systematic approach for internalizing knowledge and converting it into observable behavior.



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SETTING COMPETENCE REQUIREMENTS

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Can companies assure new competence needs are met?

Assuring that people do not become a bottleneck in future business:

- What does your organization's technology forecast imply about a demand for different competence areas in the future?
- Will today's dominant technical disciplines remain strong or will they weaken over time and be replaced by other technical disciplines?
- What does customer insight imply about a requirement for learning about a new discipline or learning area?
- What is the model of competence that will be required to have a capable organization in the future?
- How will this model affect your development plan for employees?

Organizations that actively learn from customer experiences have a variety of structured feedback and review mechanisms that they design into business processes across the levels of their hierarchy where they have customer touch points. This enables successful operation of "triple loop learning."

The process of understanding competence needs:

Three pathways for understanding competence requirements:

- **Delphi Technique:** Management team involved in a series of workshops to process their opinions about the critical competence requirements of the organization using a consensus-driven process through sequential trials of "group voting" which leads to a core set of significant competences. At the end of the process a competence library is developed and mapped to a set of positions that are of strategic value to the organization.
- **Job Analysis:** Analysis of the content of work to determine the set of skills, attitudes and knowledge required to perform the specified tasks of job. An analysis may be conducted by direct observation of tasks by a researcher, examination of work diaries recorded by workers, work sampling based on random recorded events (e.g., workers given a specially alarmed watch that beeps at random times to cue recording of participant's activities).
- **Critical Incident:** Interviews are conducted with role model and average employees identified by management for perceived performance in the specific of position. Each participant is probed in an interview to describe specific behaviors as they are involved in a critical incident. Transcripts are recorded and psychologists code the behaviors. The set of behaviors in common between the groups are eliminated from behaviors of the superior group as these represent base competence for the position. All remaining competence are critical areas that assure success in a position.

Critique of competence modeling techniques:

Competence Modeling Techniques	Delphi Method	Job Analysis	Critical Incident Interview
Description	Management team conducts rounds of brainstorming with multi-voting using the nominal group to gain a consensus on the job model.	Professional does a detailed time-motion and content analysis of "role models" in the job as a means to identify critical job elements and define the job model.	Trained facilitator will conduct the "critical incident" interviews and psychologists will code behaviors using interview transcripts as the basis for the job model.
Advantages	<ul style="list-style-type: none"> • Fast to conduct • Engages managers 	<ul style="list-style-type: none"> • Observation-based • Independent task analyst 	<ul style="list-style-type: none"> • Most scientific • Can provide future perspective
Disadvantages	<ul style="list-style-type: none"> • Subjective result • Limited by the personal level of experience of the panel. • No future forecast. 	<ul style="list-style-type: none"> • Quasi-objective resulting model • Limited to current job and tasks that are observed by the analyst. 	<ul style="list-style-type: none"> • Most consuming of time and resources • Limited number of models built, only the most valuable or important positions.

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Applications of competence modeling:

How do organizations use competence to increase competitiveness?

- Developing position descriptions for "generic" jobs.
- Establishing requirements and criteria for recruiting and selection.
- Customized development or tailoring of training and development offerings.
- Designing custom coaching, mentoring and on-the-job training experiences.
- Evaluating contribution risks based on individual competence performance.
- Preparing model career development plans and succession planning.
- Evaluating performance in the HR review and management process.
- Setting compensation levels and determining incentive pay.

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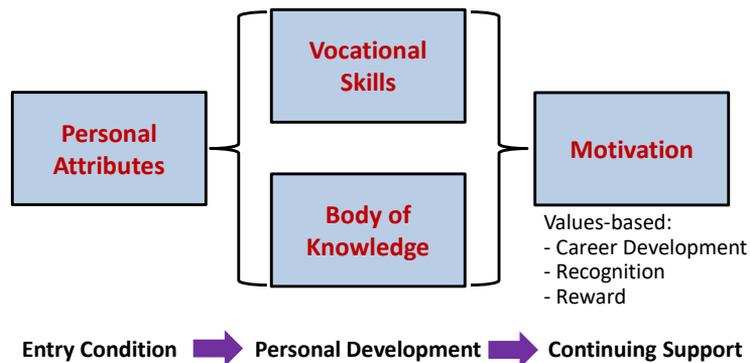
Applying the competence model to an organization:

What to do once a competence model is developed?

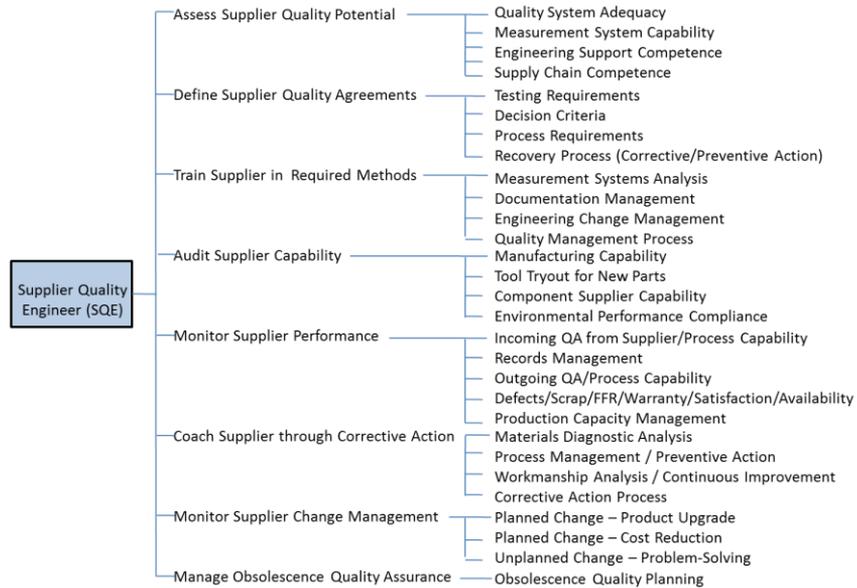
- Discover the current **inventory of skills** that exist in current employees and how this creates a core competence for the organization – what are the weaknesses among non-dominant disciplines?
- Then conduct a **needs assessment of individuals currently holding these key jobs** to assure that required skill sets are present in these people and that any gaps in skills, attitude or knowledge are identified.
- This needs assessment is a basis for design of **personal development plans** to close the gaps between required skills and the level of competence that is observed in individuals currently occupying these positions.
- The competence model for a specific position may also be used as a tool for **succession planning** to assure that the future skills required in the organization will be delivered through the promotion process and that the growth pathway of individuals is clearly aligned with future development. [Note: succession planning must not be limited to a sequence of career positions or replacement of key individuals in prominent jobs.]

Competence model for a supplier quality engineer – 1:

Individual competence begins with selection and continues in training and the development of experience through operations and problem-solving in the job skill and knowledge areas. Attitude is affected by experience and motivation of the employee.



Competence model for a supplier quality engineer – 2: SQE Work Breakdown Structure:



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Competence model for a supplier quality engineer – 3:

Process Scope for Job Description: Supplier Quality Engineer	Supplier Quality Engineer Vocational Success Factors		
	Attitude	Skill	Knowledge
Quality System Adequacy	Skeptical Attitude	Quality Documentation	Blueprint Symbols
Measurement System Capability	Process-Oriented	Quality Audit	Statistical Methods
Engineering Support Competence	Numerically Astute	Requirements Analysis	HW Reliability Testing
Supply Chain Competence	Fact-Based/Analytical	Process Analysis	SW Quality Methods
Testing Requirements	Communicative	Process Mapping	ISO9000, ISO14001
Decision Criteria	Coaching-Guiding	Measurement Analysis	ISO22000 - Software
Process Requirements	Technically Astute	Statistical Thinking	Gage R&R Studies
Recovery Process (CA/PA)	Accepts Responsibility	Minitab Software	Corrective Action
Measurement Systems Analysis	Independent Initiative	Capability Analysis	Preventive Action
Documentation Management	Customer-Oriented	Reliability Testing	DMAIC Diagnostics
Engineering Change Management	Politically Astute	Negotiation	Customer Survey
Quality Management Process	Culturally Astute	Presentation/Writing	Destructive Testing
Manufacturing Capability	Results Oriented	Computer Graphics	Supplier Quality Mgmt.
Tool Tryout for New Parts	Team-Oriented	Active Listening	Requirement Setting
Component Supplier Capability	Integrity	Personal Communication	Group Dynamics
Environmental Performance Compliance			
Incoming QA from Supplier/Process Capability			
Records Management			
Outgoing QA/Process Capability			
Defects/Scrap/FFR/Warranty/Satisfaction/Availability			
Production Capacity Management			
Materials Diagnostic Analysis			
Process Management / Preventive Action			
Workmanship Analysis / Continuous Improvement			
Corrective Action Process			
Planned Change – Product Upgrade			
Planned Change – Cost Reduction			
Unplanned Change – Problem-Solving			
Obsolescence Quality Planning			

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GAINING COMPETENCE IN INNOVATION

Innovation: Mastering associational thinking

Seeing differently – Thinking differently – Acting differently

Innovation is a process of competence development to adjust one's thinking to gain insight. "Best practice" in innovation focuses on three areas:

- **Individual Development:** attitude, cognitive skills, behavioral skills
- **Cultural Adaptation:** Curious, flexible, risk-taking, mistake-forgiving, rewarding
- **Structured Process:** Knowledge base, experimentation, freedom, teamwork

Innovation can be developed and is capable of being converted into a process. Curious people who are willing to take (or are encouraged) to take risks can systematically develop processes that encourage questioning, observing, networking and experimenting as means to stimulate or act as catalysts for associational thinking: connecting ideas that previously had been unrelated to formulate a new concept.

* Jeffrey H. Dryer, Hal B. Gregersen and Clayton M. Christensen (2011), *The Innovator's DNA: Mastering the Five Skills of Disruptive Innovation* (Boston: Harvard University Press). More on these innovation skills in the next section on competence development.

Developing competence as an individual innovator:

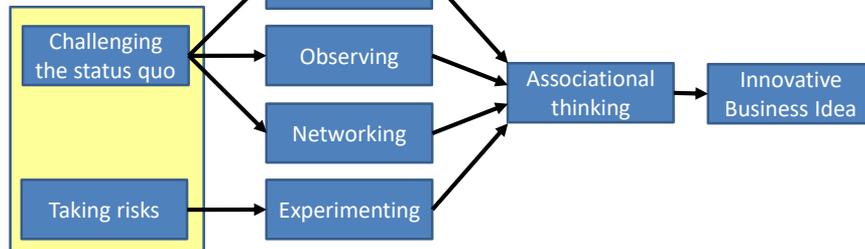
Structured Innovation Process

Innovator's DNA Model for Generating Innovative Business Ideas

Courage to Innovate

Behavioral Skills

Cognitive Skill
[Synthesize novel inputs]



Innovative ideas are much more likely to be generated in business cultures that encourage experimentation and continual improvement, risk taking, setting up challenges or conflicts to be resolved. People must be willing to participate in activities that expand knowledge and they must have courage to act without a fear of reprisal or loss of self-esteem. Business leaders have the job to create a culture that is conducive to innovation and provide people freedom to do so.

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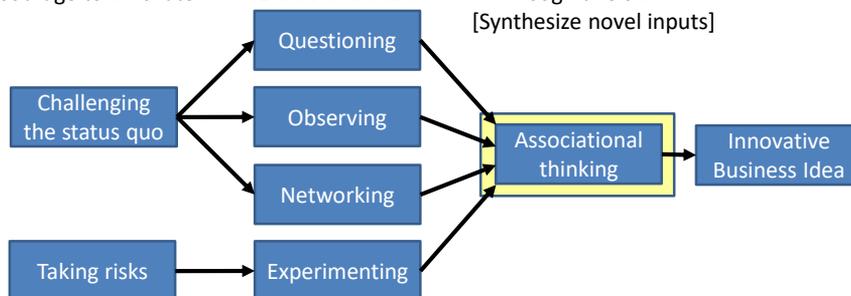
Key innovation competence: Associational thinking!

Structured Innovation Process

Courage to Innovate

Behavioral Skills

Cognitive Skill
[Synthesize novel inputs]



The ability to synergize and systematize diverse ideas is critical to innovation.

- **Associational thinking:** the ability to make “surprising connections” across domains of knowledge, industries, or culture. Albert Einstein called such “combinatorial play” the “essential feature in creative thought.”
- Behaviors that encourage associational thinking: questioning, observing, networking, and experimenting.

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Increasing associational thinking skill:

How to increase associating skills?

- Tip #1: Force New Associations – Combine things that are not naturally used together (concept behind the use of TRIZ).
- Tip #2: Assume the Persona of a Different Organization – Consider how a different organization would approach an issue. What would happen if a merger occurred between your organizations – what would be different?
- Tip #3: Generate Metaphors – Consider “what if” your product could do a cool thing that products from unrelated applications do? How would this change the capability of your product?
- Tip #4: Build a Curiosity Box – Gather a box of thought-provoking toys and “hot” gadgets that can be physically manipulated to build metaphors and ideas for new applications.
- Tip #5: Try Using SCAMPER – Use the SCAMPER structure to question the approach you are taking and to rethink the opportunity through using a different mental model or concept that reframes the issue and allows you a fresh insight.
- Tip #6: Define a Creative Space and Time – Ideas need time to “cook” and develop just as people need to have a safe environment and place where they have the freedom to think.

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Associational thinking: SCAMPER for idea generation

Steve Jobs: “Creativity is connecting things.”

*One way is a process of problem reformulation: The S.C.A.M.P.E.R. Method **

- A checklist of questions aimed at stimulating creativity by giving a structure for investigating how change could happen in a specific problem statement.
- The following SCAMPER questions can be used in combination with other Innovation tools such as brainstorming, association, and knowledge or mind mapping:
 - S = what can be Substituted for ...?
 - C = what can be Combined with ...?
 - A = How can ... be Adapted?
 - M = How can ... be Modified or Miniaturized?
 - P = How can ... be Put to other uses?
 - E = How can ... be Eliminated?
 - R = What if ... were Reversed or Rearranged?

* Robert F. Eberle (1972), “Developing Imagination Through Scamper,” *Journal of Creative Behavior*, 6:3, p. 72.

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Questioning – the most critical behavior:

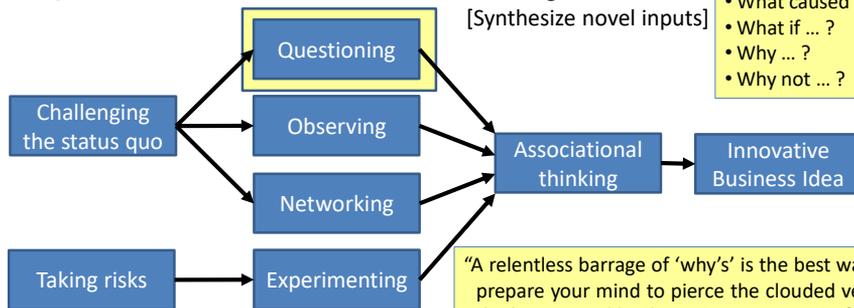
Structured Innovation Process

Courage to Innovate

Behavioral Skills

Cognitive Skill

[Synthesize novel inputs]



Great questions

begin with:

- What is ... ?
- What caused ... ?
- What if ... ?
- Why ... ?
- Why not ... ?

Question the unquestionable!

- Questioning is the creative catalyst for the other discovery behaviors (e.g., observing, networking and experimenting).
- Questions must be penetrating, challenging and sometimes create conflict!
- Never stop being curious and asking questions to discover “what if” sets of conditions thereby building knowledge of the system behind the facts.

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Albert Einstein on innovative pursuit of knowledge – 1:

Einstein put a great deal of thought into his own process for innovation:

- “I have never felt I was wasting time. Science is a process of trial and error. The only sure way to avoid making mistakes is to have no ideas.”
- “Perfection of means and confusion of goals seem to characterize our age.”
- “Only the one who does not question is safe from making a mistake.”
- “Not everything that counts can be counted and not everything that can be counted counts.”
- “I do not like to state an opinion on a matter unless I know the precise facts.”
- “Knowledge of what is does not directly open the door to what should be.”
- “For the scientific method can teach us nothing else beyond how facts are related to, and conditioned by, each other.”
- “To raise new questions, new possibilities, to regard old problems from a new angle, requires creative inspiration and this marks real advances in science.”

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Albert Einstein on innovative pursuit of knowledge – 2:

- “Scientific research can reduce superstition by encouraging people to think and view things in terms of cause and effect.”
- “The whole of science is nothing more than the refinement of everyday thinking.”
- “The grand aim of all science is to cover the greatest number of empirical facts by logical deduction from the smallest number of hypotheses or axioms.”
- “I have no special talents. I am only passionately curious.”
- “Most teachers waste their time by asking questions that are intended to discover what a pupil does not know, whereas the true art of questioning is to discover what the pupil does know or is capable of knowing.”
- “The important thing is not to stop questioning. Curiosity has its own reason for existing.”
- “It is difficult to say what truth is, but sometimes it is so easy to recognize a falsehood.”

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Enhancing ability to ask penetrating question:

“If only I had the right question ... If I only had had the right question ... the formulation of a problem is often more important than its solution. Raising new questions requires creative imagination ... imagination is more important than knowledge.”
~ Albert Einstein

How to increase questioning skill?

- Tip # 1: Engage in “Question Storming” – conduct “question-only” sessions for brainstorming. *
- Tip #2: Cultivate “Question Thinking” – define all issues (e.g., problems or challenges) as questions rather than as statements.
- Tip #3: Track your Question/Answer ratio to assure you emphasize the Q’s!
- Tip #4: Keep a question-centered notebook to document Socratic dialogs.
- Tip #5: Ask “what if” questions to define constraints and find boundaries.

“The important and difficult job is never to find the right answers, it is to find the right questions. For there are few things as useless – if not dangerous – as the right answer to the wrong question.”

~ Peter F. Drucker
The Practice of Management (1956)

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* Marilee Goldberg (1997), *The Art of the Question* (New York: Wiley).

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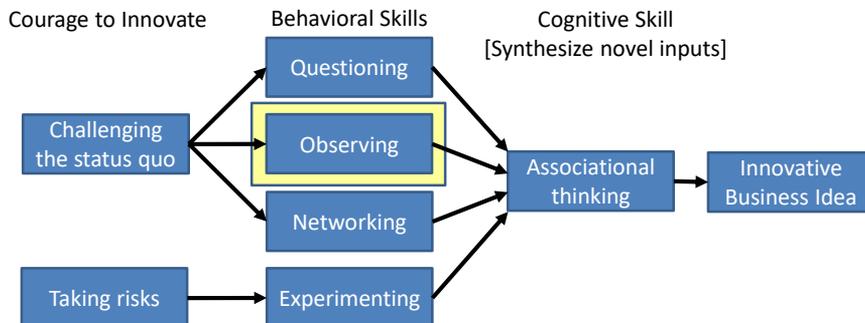
Ask yourself questions about your own questions:

Review your “question-centered” notebook to determine:

- What are your questioning patterns?
- What kind of questions do you focus on?
- What questions yield unexpected insights into why things are the way that they are?
- What questions surface fundamental assumptions and challenge the status quo’s way of doing things?
- What questions generate strong emotional responses (an indicator of challenging the way things are)?
- What questions guide you best into disruptive territory (where interesting answers may lie)?

Observing:

Structured Innovation Process



Observation sensitizes observers to what works and what doesn't work!

- This is especially important in gaining insight into customer scenarios or their “point of view” to discover what is the job that needs to be done; even when the customer also doesn’t know.
- Every job of the customer has functional, social and emotional dimensions that must be discovered – observation is not a purely physical activity.
- Actively watch customers and think about workarounds to their issues.

Combine questioning skills with observing skills:

Questions to ask when observing customers:

- How do customers become aware of a need for your product? Is there a way to make it easier or more convenient for them to find your offering?
- What do customers really use your product for? What job is the customer hiring your product to perform (answer in their own words)?
- What does the ultimate customer consider the most important features or functions when selecting this product?
- How do customers order and purchase your product? Is there a way you can make it easier, more convenient, or less costly?
- How do you deliver your product? Can you do it faster, cheaper, in a completely different way?
- How do customers pay for your product? Is there a way to make it easier or more convenient?
- What frustrations do your customer have when trying to use your product? Do they use your product in ways you did not expect?
- What do customer need help with when they use the product?
- Do customer do things that hurt the longevity or reliability of your product?
- How do customers repair service, or dispose of your product? Is it possible to make this easier or more convenient (or teach the customer how to use the product so it requires less maintenance)?

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Consciously look for “surprises” – the unexpected:

Discovery of an anomaly provides a good opportunity to question status quo!

- Breakthrough discovery often happens when we observe how a commonly-held paradigm fails to work as expected [Thomas Kuhn (1962) ***The Structure of Scientific Revolutions***].
- Such a discovery may create a competency-enhancing or a competency-destroying situation; change architecture or modular structure of products; or result in a disruptive situation for the sustaining technology [Clayton M. Christensen (1997) ***The Innovator’s Dilemma***].
- Understanding and explaining these observed anomalies brings new ideas for how to advance designs. The “surprise” – like Newton’s falling apple – is a gift that may unlock innovation which can disrupt the industry technology and lead to competitive advantage.

Discovery of an anomaly provides a good opportunity to question status quo!

- Tip #1: Intensely observe your customers.
- Tip #2: Benchmark leading companies to avidly follow their innovative ways.
- Tip #3: Observe carefully using all possible perspectives: both physical and intellectual functions as well as social and emotional dimensions.

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Networking:

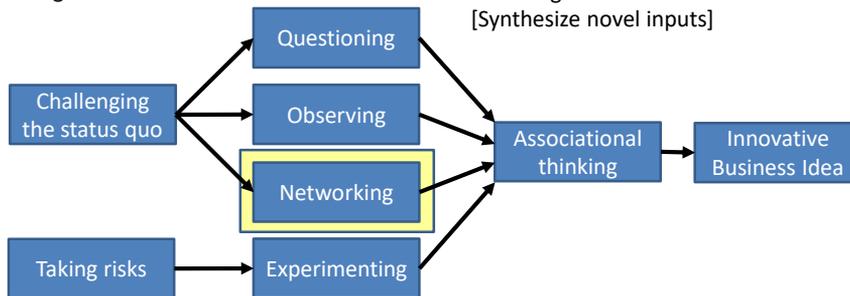
Structured Innovation Process

Courage to Innovate

Behavioral Skills

Cognitive Skill

[Synthesize novel inputs]



Idea-networking innovators will:

- Link-up with people who are unlike themselves to gain new perspectives.
- Link with topical experts, application experts, functional experts as well as those from divergent fields.
- Networking provides an opportunity to conduct a “test trial” on ideas that are still a “work-in-progress” and not ready for internal disclosure.

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Improving the quality of your networking:

“What a person does on his own, without being stimulated by the thoughts and experiences of other, is even in the best of cases rather paltry and monotonous.”

~ Albert Einstein

How to increase the efficiency of your network?

- Tip #1: Expand your acquaintances on Linked-in and Facebook.
 - Tip #2: Increase the diversity of your networking group.
 - Tip #3: Consider a “mealtime” networking plan – meeting over meals.
 - Tip #4: Plan to attend at least two professional conferences annually.
 - Tip #5: Initiate a personal network or creativity community.
 - Tip #6: Invite external experts to address your team at an “open house.”
 - Tip #7: Conduct cross-industry meeting with peers to gain their insights.
- What organizations should be targeted for networking?
 - What organization has faced or solved problems like ones you have today?

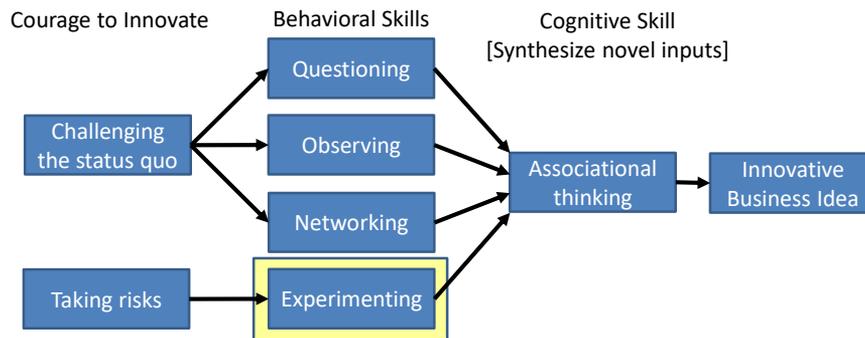
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Experimenting – the least popular innovation skill:

Structured Innovation Process



Test innovative ideas in a variety of ways:

- Interview your network and ask salient questions about their experiments.
- Try new experiences or expand investigations into other industries.
- Reverse engineer or breakdown designs of interesting products, processes, or concepts from competitors or leading organizations.
- Test ideas through pilot experiments or rapid prototypes using “agile” logic.

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Improving the efficiency of your experiments:

“Scientific research is a process of guided learning. The object of statistical methods is to make that process as efficient as possible.”

~ George E. P. Box

Experimentation provides the most robust ideas about future performance:

- Tip #1: Cross physical borders to discover what works in other countries or cultures and seek ideas to replicate.
- Tip #2: Cross intellectual borders by expanding your study into new topics that broaden your intellectual context and work horizon.
- Tip #3: Develop a new skill or hobby that is external to your normal work.
- Tip #4: Disassemble a product to discover how it was designed and built.
- Tip #5: Build prototypes to test new ideas about something that you want to improve or redesign (consider buying a three-dimensional printer!).
- Tip #6: Regularly pilot and experiment – most of what we learn comes by trial and error – mistakes are a pathway to knowledge.
- Tip #7: Conduct future studies and trend-spotting – study the work of the people who are good at spotting new ideas (e.g., Wired Magazine) and see what new ideas might be worthwhile subjects for future experiments.

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Structuring and developing an innovation process:

Developing innovation competence as a core dynamic capability:

- Pay attention to the cultural dimension in interpretation of experience.
- Observe from different perspectives – bracket yourself to be objective.
- Remain curious and question the relationship of things relentlessly.
- Experiment and then experiment some more.
- Seek knowledge from many disciplines and investigate other industries.
- Build a creativity network for sharing perspectives and seeking discovery.
- Develop a structured approach to innovation and use different methods to help generate insights into how synergies may be created to satisfy needs of different scenarios.
- Never stop questioning!

Thank you! Any questions?

BUSINESS EXCELLENCE SOLUTIONS





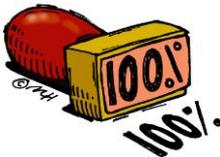
Part 4: Customer Insight

BUSINESS EXCELLENCE SOLUTIONS



1

Design must deliver on marketing's promises!



"There is only one valid definition of a business purpose:
to create a customer."

"Business begins and ends with the customer."

~ Peter F. Drucker
The Practice of Management

"Our customer deserves to receive **exactly** what we have promised
to produce."

~ Philip B. Crosby
Quality is Free

"With an explosion of competitors, many of them new and
without track records, **reliability**, rather than overly
aggressive [marketing] promises, is the most valuable
strategic edge, especially in the mid-to-long haul."

~ Tom Peters



2

What have we learned about customers so far?

Customer Insight: Organizations that can perceive emerging requirements of their 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. The development of insight requires a dedicated pursuit of customer relationships.

Noriaki Kano's model of **"Attractive Quality"** describes the relationship between engineering performance in design of product features and an assessment of the relative attractiveness of those features to intended customers. Kano specified three functions: "must be" quality which is typical of commodity products; "one-dimensional" quality which relates to competitive products; and "attractive quality" which is reserved for innovative products that are anticipating unmet customer needs.

"Customer Intimacy" is a customer-centered value proposition that a business can use to focus on its competitiveness. This value proposition seeks to customize solutions to specific problems, issues or concerns of targeted customers. It requires organizations to gain knowledge that leads to innovative insights or imaginative understanding of the needs of customers to get meet their own objectives – getting their job done.

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Continuous innovation drives continual improvement!

Consumers make judgments about the capability of delivered goods and services based on their personal experience. Their satisfaction is based on a comparison of their perception of their experience with performance as compared to an initial expectation for performance.

When customers purchase a new product they have fundamental expectations of its capability: performance should be better (reliability of performance as well as the capability of features and functions) and cost should be equal, but preferably lower. Thus, customers have a rising expectation for continual improvement of the product that can be experienced through rational observation of their activity and experience in use of that product.

Rising expectations; however, can only be addressed through a systematic process of innovation which relentlessly drives promising, attractive features, functions, and applications into existence based on the organization's competence to design and its insight into customer activities. Thus, delivery of continual improvement is linked to stimulation of continuous innovation. How can a systematic process of structured innovation be managed?

$$\text{Satisfaction} = \frac{\text{Performance Perception}}{\text{Results Expectation}}$$

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Intensely observe your customers “on-the-job:”

Questions to ask when observing customers:

- How do customers become aware of a need for your product? Is there a way to make it easier or more convenient for them to find your offering?
- What do customers really use your product for? What job is the customer hiring your product to perform (answer in their own words)?
- What does the ultimate customer consider the most important features or functions when selecting this product?
- How do customers order and purchase your product? Is there a way you can make it easier, more convenient, or less costly?
- How do you deliver your product? Can you do it faster, cheaper, in a completely different way?
- How do customers pay for your product? Is there a way to make it easier or more convenient?
- What frustrations do your customer have when trying to use your product? Do they use your product in ways you did not expect?
- What do customer need help with when they use the product?
- Do customer do things that hurt the longevity or reliability of your product?
- How do customers repair service, or dispose of your product? Is it possible to make this easier or more convenient (or teach the customer how to use the product so it requires less maintenance)?

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Forces Driving Leadership through Quality:



- Part 1: Managing for Quality by Design
- Part 2: Innovation Stimulation
- Part 3: Competence Development
- **Part 4: Customer Insight**
- Part 5: Systems for Quality Development



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Topics related to customer insight:



- Learning About Customers
- Capturing the Customer's Voice
- Designing for Customers
- Analyzing the Customer's Response
- Monitoring the Customer's Experience
- Managing the Customer's Concern
- Assessing Customer Satisfaction
- Generating Customer Delight

7



LEARNING ABOUT CUSTOMERS

8

Describing dynamics of customer management:

Factors for initial customer focus to attain insight:

- Market Forces
- Consumer Behavior
- Market Research
- Customer Segmentation
- Brand Awareness
- Customer Perception
- Voice of the Customer
- Marketing Process
- Point of View
- Market Niche
- Product Positioning
- Product Benefits
- Mystery Shopping
- Brand Reputation
- Customer Desire
- Customer Expectation
- Customer Need
- Customer Requirement
- Product Features
- Customer Risk
- Marginal Benefit
- Marginal Utility
- Reverse Quality
- Price Tolerance
- Price Elasticity
- Customer Judgment
- Sales Process

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Describing dynamics of customer management:

Factors for continuing customer focus to maintain insight:

- Major Accounts
- Target Market
- Dealer Channels
- Preferred Customer
- Customer Councils
- Consumer Rights
- Market Share
- Market Penetration
- Installed Customer Base
- Customer Touch Point
- User Interface
- Customer Support
- Sales Returns
- Field Failures
- Field Returns
- Customer Risk
- Customer Service
- Customer Care
- Customer Complaints
- Satisfaction Survey
- Customer Satisfaction
- Brand Loyalty
- Customer Loyalty
- Customer Retention

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Reflection: How do you answer these questions?

- Who are our customers? Which of these customers is the most valuable to us?
- What is important to these customers about the goods or services that we deliver as well as our relationship with them?
- How do we know how well we are performing in the eyes of these customers? What measures do we monitor for this performance? What customer events trigger a strategic response that changes our business operations?
- What other organizations are providing our customers with similar goods or services (these are our direct competitors)? What other organizations could choose to provide our customers with similar goods or services (these are our latent competitors)?
- Who is best in the eyes of our most important customers? What differentiates these top performers from their competitors?

“To obtain sustained success in business results, excellence must be expressly embedded into the customer’s experience with your product or service.”

Customer Segmentation: Who is our customer?

Organizations have many different categories of customers:

- Customer segmentation decomposes customers into rational categories by specific groups that are similar to study effects that are relevant design, sales and marketing of products. Better insight into market dynamics will occur when many different ways to segment customers are used to find the underlying trends for purchasing and usage behavior.
- Segmentation may be apply logic of demographics, needs, value or market share to define customer categories.
- Customer proxies (e.g., surrogate customers (individuals who speak for the customer), latent customers (potential customers), archetypes (psychology-based attributes for customer behavior)).
- Customers may also be grouped according to motivational reasons for their choice (e.g., purchasing behavior, motivation (i.e., impulse buyers, fashion conscious, bargain hunters, status seekers, early adopters, etc.), or lifestyle seekers).
- Segments may also be grouped according to dominant needs (what does a customer want the product to: give them (capability to be achieved); save them (manage resources better through reduced time, risk or money); or help them (achieve a goal through service).

Point of View: How will they use the deliverable?

Customer Point of View (POV) conditions Voice of the Customer (VOC)!

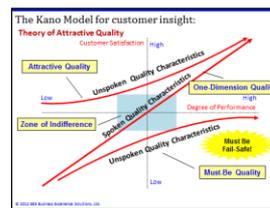
- Customers have differing points of view: economic buyer, decision-maker, end user, or consumer. Getting to know who your customer is; how they will use or apply the product or service; what are their specific expectations for delivering performance; and their criteria for success will help to better specify product requirements and achieve customer satisfaction.
- The Customer POV is an important part of the VOC table. It identifies the “voice” that is speaking in the reported information about requirements.
- Customer POV should be as specific as possible: identifying the segment of the market, industry, company, position of the individual, and even naming the person who is reporting. This is particularly helpful whenever a certain POV actually expresses clearly the VOC comments that become functional designs in the final product. Return interviews or focus group participation that are video-taped can become an important source of information with which to refresh memories throughout the entire new product design and development process.

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What's the difference: customer versus buyer?

The “buyer” is an economic customer:

- Professional purchasing agent or buyer.
- Emphasis on cost in the decision process.
- Supported by users for technical reviews.
- May consider acquisition or total lifetime cost.
- Equally applies to commodity or custom goods.



Activities of the “buyer” and scope of authority:

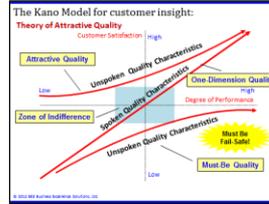
- Job of the buyer is to seek sources for acquiring items, solicit offers and manage the requisition and purchasing process, and negotiate contracts of sale including terms and conditions.
- Often the buyer is not the decision-maker for a purchase as authority is typically delegated based on financial thresholds for acquisition as well as other control functions to assure fiduciary responsibility.
- Decision criteria are dominantly objective and emphasize the “spoken” set of requirements that are transparently communicated to all the potential providers of the desired item. Buyer decisions emphasize quality in the “one-dimensional” function of the Kano Model.

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What's the distinction: customer verses consumer?

A "Consumer" is not just a commodity buyer:

- Emphasis on lowest total cost.
- Emphasis on value (quality with respect to cost).
- Makes frequent, often bulk, purchases.
- Purchases for use, rather than resale.
- Consumers have decision rights regarding the purchase and are capable of being influenced by marketing campaigns and advertising.



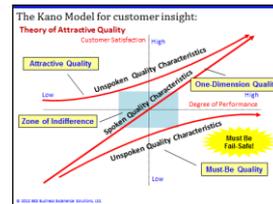
Challenges of the Consumer Market:

- Consumers make complex decisions and the criteria changes with each of their acquisitions.
- Consumer choice is both need-driven and economics-driven, especially so if the economic situation is personal as compared to corporate.
- Decision characteristics of the consumer will blend the considerations of the "buyer" and the "user" in a complex mosaic of choice criteria that will operate in a complex manner across all three functions in the Kano Model.

What's the distinction: customer verses user?

The "User" is the individual who does a job:

- Acquisitions are made to perform a "job."
- Users interact with the item at their job-site.
- Emphasis is placed on "utility" and "ease of use."
- Ergonomic and interface features are important.
- Cost considerations relate to operational impact.
- Users take a long-term perspective and seek reliability or an ability for the item to perform at or beyond the necessary quality level for at least the specified period of operational life.



Considerations in the "User" acquisition decision:

- User considerations will emphasize the technical merits of an item rather than its acquisition cost. Value will be judged based on life-time costing.
- Users will be concerned with: technology support, responsiveness to any issues or operational problems, reliability and consistency of performance, delivery and installation performance, and service capability.
- While a buy will be objective in making acquisition decisions, users may be more subjectively influenced as they develop loyalty to items based on the experience that they have had in the past. Customer experience is critical!

Voice of the Customer: What do they say they want?

Capturing customer expressions: expectation, preference, aversion.

- Voice of the Customer (VOC) describes the set of desirable characteristics of a product (expected and preferential features as well as quantitative levels of performance) as well as undesirable characteristics (aversion to a feature, design element or performance level).
- Obtaining VOC requires development of a detailed understanding of the customer requirements based on a job the customer wants to accomplish and it becomes a “common language” that is shared between developers of products and customers. The VOC analysis consolidates inputs for team consideration in development of design specifications and stimulates the innovation process within R&D teams.
- VOC analysis must be: understood from the particular Point of View (POV); expressed in the language of the customer; indicate wants and needs for the current and future state; organized into affinities to demonstrate how ideas are linked; prioritized by importance: in comparison; and compared to current performance and satisfaction with the current state.
- Considerations to evaluate in determining value of the VOC are: credibility of the source, reliability of the information in cross-checks with internal customer data and the ability to predict future market behavior, trends and levels of customer satisfaction with new products.

Customer Requirement:

Customer requirements are critical-to-quality in new product design!

- Customer requirements define the needs or conditions to be met in design of a new or modified product which includes the POV of various categories of stakeholders and customers and performs a conflict analysis to identify incompatible requirements or specifications that must be resolved during the design process.
- Customer requirements should be identified as deliverables to customers (performance characteristics that are perceived as desirable to customers) and for service (definition of the relationship that the customer wishes to have and the way they want to be treated in interactions).
- Requirements development begins by capturing VOC verbatim comments, sorts and prioritizes ideas to define marketing features, translates the set of marketing features into functions to develop engineering detail.
- A “*use case*” should be developed to support each functional requirement and describe the behavior of the requirement in an operational scenario of the user in order to support the design and testing of its functionality.

Customer Expectation: What is customer counting on?

*Customer expectations identify benefits customers **MUST** receive!*

- While customer requirements typically refers to performance deliverable through new product design, customer expectations typically refers to the customer performance desires regarding the on-going service, support, or maintenance processes.
- Customer expectations are addressed by customer care or service groups during an “after-sales” situation. Managing the specification and level of customer expectations is a key business need as “creeping expectations” may become too costly for the original budget estimated for product field support.
- It is essential that “expectations” be agreed between customers and those who are its service providers. These expectations should be set for three aspects: effectiveness (the product of availability, efficiency, and quality of deliverables), responsiveness to issues of varying degrees of severity, and supportability (degree of access to help available as well as depth of help functions available by customer type or category).
- Expectations should be set to define not only “what” is expected, but also “how much” or magnitude of performance that is expected in a **Service Level Agreement (SLA)**.

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Marketing Process: How does this relate to customers?

Marketing strategies are based on long-term customer insight:

- What does an organization wish to achieve according to the insight that it has developed about its customers?
- Generally, four categories of action are considered:
 - **Acquire** Customers – actions taken to create new customers in specific niches.
 - **Retain** Customers – actions that maintain or keep the current customer base from switching loyalty or acquisition to alternative providers.
 - **Develop** Customers – actions taken to grow or expand relationships with a set of customers sharing a particular set of characteristics.
 - **Divest** Customers – actions taken to reduce engagement of customers that are low-value in terms of profitability or market continuity.
- Marketing strategy transitions:
 - Moving from broad understanding based on historical or demographic views of customers to predictive, value-based viewpoints that estimate future profit obtainable from each customer category or specific customer.
 - Moving from broad proxy-based understanding of needs to specific customer clusters that identify specific feature requirements as a function of the specific benefits required by customers.

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Selling Process: How does this relate to customers?

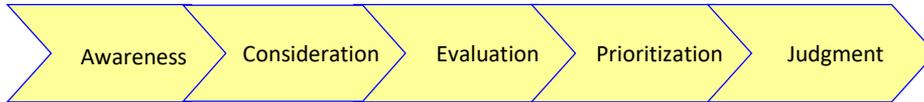
Sales strategies are short-term engagements to encourage decisions:

- Systematic approach to selling.
- It is a sequence of engagements.
- Desired result is closing the sale.
- The sales process must manage the expectations of the buying process.

"There should be no reason our familiar principles of quality and process engineering would not work in the sales process."

~ Joseph M. Juran

Example of a sales process:



- Critical activities in the selling process are assessment of customer needs, qualification of the buyer, presentation of the offer and negotiation of the agreement. The selling process increases the "information content" about the buyer and encourages progress in advancing through the sales phases.
- From the sales point of view these steps reduce the risk of wasted time in activities that do not lead to sales closures. However, from the buyer's point of view the process leads to greater assurance of the satisfaction of their acquisition criteria.

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Comparison of buyer-seller process dynamics:

Sales Objectives

Identify target organization's business needs and position to meet needs	Initiate contact with buyer's organization to listen to needs & build rapport.	Verify correct information on customer need and match with value-added.	Clearly define solution range that exceed competitive range.	Gain personal commitment & agree on next steps. Close the sale.	Execute the sales contract, check progress, and adjust the sales plan.
Sales Process					
Prepare	Open	Qualify	Position	Close	Follow-up
↓	↓	↓	↓	↓	↓
Recognize	Initiate	Design	Evaluate	Commit	Implement
Buying Process					
Understand own business need and position for future business needs.	Clarify business needs & survey options for own applications.	Establish the value/price & future need that need to be considered.	Evaluate all proposals for business need, total cost and switching cost.	Make a choice to purchase the solution that best meets price/need.	Solve business problems with application and build continuing relationships.

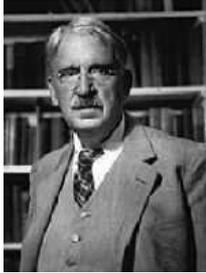
Buyer's Objectives

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Pragmatic philosophy links practice with theory:



John Dewey (1859-1952)

Professor, Columbia University

American Educator, Philosopher, and Psychologist

- ***How We Think*** (1910)
- ***Logic: The Theory of Inquiry*** (1938)
- ***Knowing and the Known*** (1949)

“There is no question of theory *versus* practice but rather of **intelligent** practice versus **uninformed** practice.”

“Every great advance in science issues from audacity of imagination.”

“Failure is instructive. The person who really thinks learns quite as much from his failures as from his successes.”

- Experience is the ultimate test of truth and explaining connections and meaning are important aspects in developing an understanding of the reality that we observe and **experiential verification** is also a criteria that is both necessary and sufficient in validating a theory.

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Customer Experience: How was customer's encounter?

Exceptional customer experience requires robust, capable processes!

- Customer Experience: an interaction between a company and customers as perceived through the customer's conscious and subconscious mind. It includes rational performance of the company and has a psychological component in terms of customer feelings that are invoked as their senses stimulated and the emotions engaged. Customers intuitively record their experience and compare it with expectations at all moments of contact.
- What are the key components of customer experience management?
 - Designing value propositions by customer segment (recognizing that markets are just collections of customers sharing geographic location), to assure that targeted customer groups have a high probability of an excellent experience in all dimensions of their interaction ranging from the initial acquisition throughout the entire life cycle. Design should consider how customers will perceive satisfaction of their expectations at every customer touch point.
 - Developing capable delivery processes that will consistently deliver exceptional performance to customers
 - Maintaining process discipline in this performance capability to deliver value to customers throughout their experience

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Customer Touch Point: Where is customer's interface?

Touch points are "moments of truth" where customers interact with you:

- Every touch point is an opportunity to capture the customer's experience!
- Where do we interact with our customers (where are these touch-points)?
- Touch points are critical designing creating a distinctive customer experience.
- They must be identified as key control points in the process of management!

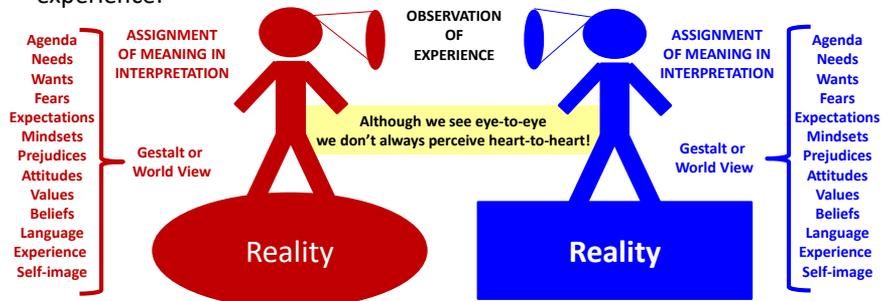
Questions to consider in reviewing quality at each "touch point:"

- How good do these processes operate?
- What is our customer's opinion about our way of working?
- Is there a gap between our perception and theirs?
- Where do we collect customer information?
- What do we do with all the information we collect?
- How do we use it to improve our services?
- How do we use it to improve our new products?
- How do we use it to improve our customer relationships?
- What additional information do we need to collect?
- How can we use the information that we have differently?
- What are our priorities for performance improvement for customers?

Customer Perception: How do they feel about the CE?

Perception: the mind, organizing sensory data to arrive at a judgment

- Customers perceive the totality of products (core product, market package and augmented product (additional services such as technical assistance, skills training, after-sales enhancement options, etc.) within the context of their own application.
- Notice that the logic customers used in their initial purchasing decision is very different from their perception of its value during use. How a person interprets their observations depends on the "lens" which they view the experience:



Customer Judgment:

Customers make judgments based on their perceived knowledge:

“The ideas and images in men’s minds are the invisible powers that constantly govern them, and to these they all, universally pay a ready submission. It is therefore of the highest concernment that great care should be taken of the understanding, to conduct it aright in the search of knowledge and the judgments it makes.”

~ John Locke

- Organizations must gain an acute perception of the ways that customers form their knowledge and the process by which they make judgments with respect to the products or services they use.
- Customers do not make judgments with their “disciplined mind” but with an “emotive mind” that is rich in conscious and sub-conscious information that is processed through their feelings and often expressed without any degree of reflective thought – what psychologists call a “*reactive*” mind.
- Judgment involves determination of what data is important and also a subjective interpretation of the meaning behind these facts. The data that customers gather may not be purposeful, but it is typically chaotic and not structured for rational reporting.
- Meaning is central to judgment and to understand is to grasp meaning.

Customer Insight: What is customer’s motivation?

Insight is needed:

Will customers remain loyal in the future based on past experience?

- Customer insight occurs in an innovative discovery process during the collection and interpretation of information about experiences. It aims at developing an imaginative understanding of the tasks that customers want to accomplish and revealing unique approaches to enhance performance in these tasks.
- The process for developing customer insight begins by analyzing all of the data about customers held in the company or available through secondary research to understand how actions taken by the company impact on the behavior of consumers (e.g., customers losing loyalty or switching to new suppliers; customers increasing complaints; customers dissatisfied with an action; etc.).
- The objective is to increase customer retention and enhance loyalty from targeted customers who are highly valued by the organization. Propensity modeling is used to evaluate potential future behavior of customers based on prior actions and responses (Bayesian model). This allows a sales team to cross-sell products or up-sell by increasing the functionality delivered.



CAPTURING THE CUSTOMER'S VOICE

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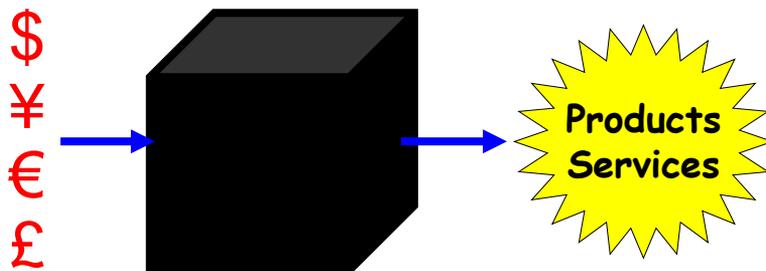
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Essential requirement for external perspective:

Customers perceive your organization as a "black box!"

- Customers don't spend much time (if any) thinking about the processes and functions required to produce, deliver, install, and support the set of products and services that they purchase beyond their initial purchasing considerations. They have an expectation for how well they must perform and feel entitled to at least that level of performance. It is the job of the supplier to assure that customers receive this performance capability.



How do you plan to gain insight into your customers perspective?

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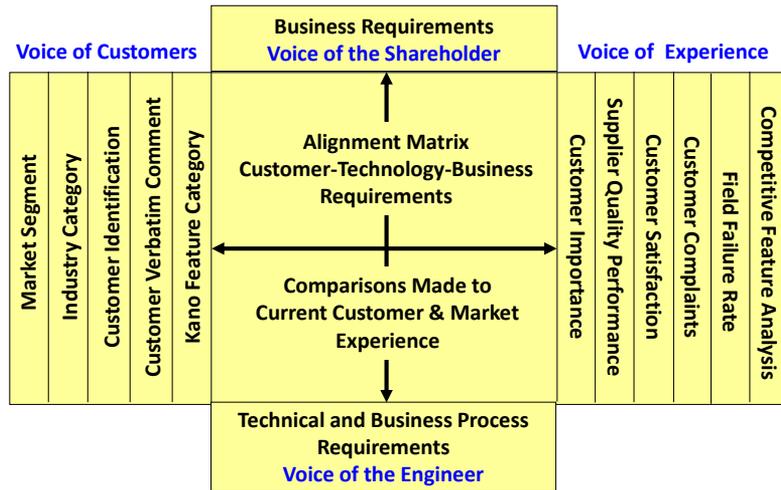
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Is there a balanced understanding of all the voices?

Customer Requirements Matrix:

In concept formulation designers must “listen” to many different voices!



How do you prioritize the relative influence of these voices on design?

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Drivers of product requirements:

In most companies, what considerations most strongly influence the development of product functions and specifications?

- Industry product standards
- Standard product requirements
- Trade customer specifications
- End-user emphasis on weight/size
- Features and designs of competitive products
- Industrial design of the user interface (display, etc.)
- Product reliability requirements
- Built-in testing requirements
- Packaging requirements for robotic assembly
- Power requirements and battery size
- Marketing-specified differentiating features
- Teardown and recycling considerations
- Environmental factors in material and process choices

Where is the “voice of the customer” considered assuring the external “point of view” is discovered and incorporated in the design?

Internal Perspectives!

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People tend to speak with obscurity; not with clarity:

- Samuel Ichiye Hayakawa (1906-1992), professor of English, president of San Francisco State University elected to the United States Senate. He specialized in semantics and linguistics and his book *Language in Thought and Action* (5th edition, 1991) describes three major types of language data: reports, judgments and inferences.
- **Reports:** presumably objective account of reality free of any personal judgment or interpretation and capable of empirical observation as a means to evaluate its truth.
- **Inferences:** a conclusion drawn based on observable data as the result of its logical interpretation. While the facts of the observation may be verifiable, the logic is subject to human fallibility.
- **Judgments:** subjective evaluations which rate or classify statements in terms of a personal scale of values.
- When people speak, they tend to “**mumble**” and mix all three types of data together. This is important because as we interview customers and they report about their perceptions, they will mix their feelings, observations, and beliefs regarding their experience with a product or service. Verbatim customer language data tends to combine requirements (reports), wishes (inferences), and complaints (judgments).

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Inputs to develop imaginative understanding:

Where does customer insight come from? Analysis of various sources of information and processing it from your customer's point of view:

- Customer Focus Groups
- Beta Testing of Products (Customer Environment)
- Internal Data on Returns, Complaints and Failures
- Sales Interviews with Current and Prospective Customers
- Business Relationships (Suppliers, Preferred Customers, Dealers, etc.)
- Market Research
- Industry Surveys
- Customer Surveys
- Secondary Research
- Patent Research
- Technology Scanning

Have you gained a comprehensive, consolidated perspective?

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Customer tables help organize application information:

Customer Table

Customer and Application Deposition Analysis				Voice of the Customer Narrative Commentary	Application Context		Customer Demanded Quality Level	Kano Attractiveness Level	Regulatory Required Minimum	Customer Importance
Industry	Company	Position	Person		Where					

- Two levels of understanding need to be developed: (1) the set of demographic questions that help to understand what job is being done by customers (who, what, when, where, why, how, and how much); and (2) the set of quality descriptors that tell how well this work must be accomplished and what is critical to satisfaction of the customer's required performance.
- The reports of customer interviews must be examined as well as translated for meaning into the language of designers and engineers who must address these requirements. Thus, customer tables must be explicit in capturing both the voice of the customer (VOC) and the customer point of view (POV)

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DESIGNING FOR CUSTOMERS

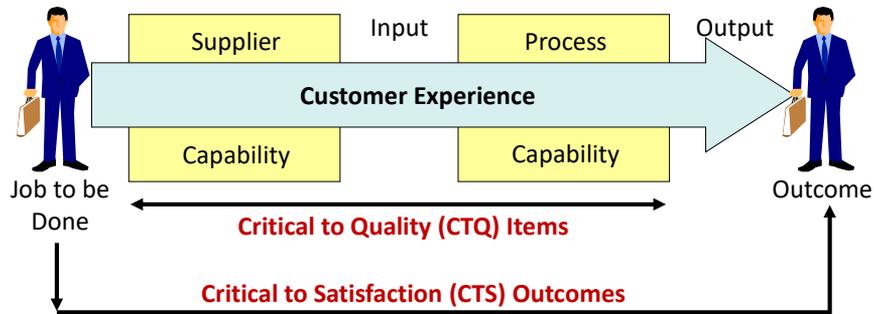
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How is impact on customers managed in your process?

Does your process guarantee its outcome will satisfy your customer?



Do you run your business outside-in or inside-out?

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Business viewpoint: Critical to quality



Critical to Quality (CTQ) – An “Inside-out” viewpoint

Critical to Quality – those internal tasks, activities, or performance factors that influence the outcome observed in the CTS factors. In the language of Six Sigma these are manageable X’s to be controlled to gain results in the Y.

These factors are typically observed in our work processes and are called the Voice of the Process (VOP). They are internal cost drivers that drive external dissatisfaction with our outcomes. Customer may not perceive “value” as the investment in our resources or the effort expended to deliver the capability in terms of process performance compared to their requirement (or a service level agreement (SLA)) may have little or no direct affect on their outcome.

Diagnoses problems from the ‘outside in’ view of our business!

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Customer viewpoint: Critical to Satisfaction



Critical to Satisfaction (CTS) – An “outside-in” viewpoint

Critical to Satisfaction – those things that help the customer ‘get their job done’ using your product or service. What is it about your product or service that your customers will purchase it or engage your service? What is their need? What is critical to satisfaction of this customer need?

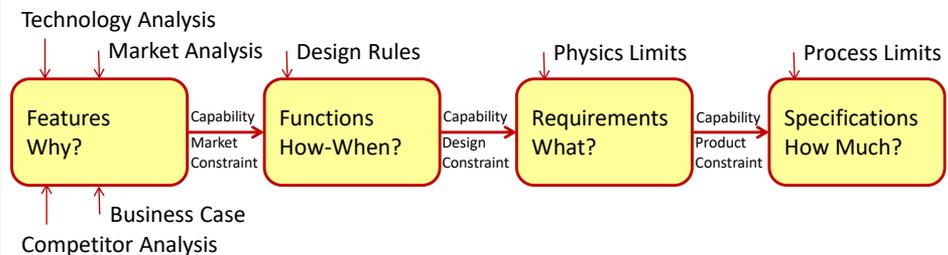
The Voice of the Customer (VOC) is tricky – it is not always expressed, and when it is described, it does not always increase our understanding! The real challenge is in learning not just to hear, but to listen to the Voice of the Customer and respond by improving those qualities that increase their satisfaction!

This requires an ‘outside in’ view of work processes!

Design must translate customer data to useful data:

Cooperative engineering will collaborate in an end-to-end design process!

Features → Functions → Requirements → Specifications



Concept C-Phase	Prototype P-Phase	Prototype P-Phase	Prototype P-Phase
Capable of delivering value to end users	Capability engineered into a product	Capability engineered into a part/module	Capability delivered by production process
<ul style="list-style-type: none"> • “A” Level QFD • System FMEA • Testing Strategy • High-Level Design 	<ul style="list-style-type: none"> • “B” Level QFD • Design FMEA • Testing Plan • System Architecture 	<ul style="list-style-type: none"> • “B” Level QFD • Product FMEA • Testing Procedure • Bill of Material 	<ul style="list-style-type: none"> • “C/D” Level QFD • Process FMEA • Testing • Specifications

Design for customers with **THEIR** end in mind!

Maintain clarity of the “voice of the customer” throughout design!

- Don't let “styling” of a product interfere with “designing” the product. In the first case the objective is fashion while the second case addresses the objective of function. Customers may 'LIKE' a fashion, but they 'REQUIRE' the function. Thus, conflicts between fashion and function must be solved without compromise of the function.

“There are two sides to the design coin. There is the serious design – making sure that the manufactured object performs its task in the best possible way. And there is styling – the essentially superficial task of making sure something looks attractive ... styling for its own sake is a lazy 20th century conceit.”

~ James Dyson

- While most companies are looking for a “WOW!” design, they should be looking for an “of course!” design!

“Great design means that one look and the end user reacts by knowing what to do with a knob or button, without as much as even thinking about it. Of course this knob is what turns the volume up, or brings up the home screen. This ‘of course’ factor is at the heart of every great design.”

~ Om Malik

Why create a QFD analysis?

Quality Function Deployment

品質 機能 展開

What is the benefit of conducting a QFD analysis?

- QFD records customer concerns, concepts and complaints.
- QFD translates customer needs into product characteristics.
- QFD traces product engineering details back to customer source.
- QFD describes relationships between design rules and features.
- QFD identifies conflicts in requirements and implementation risks.
- QFD traces manufacturing requirements back to their source.

What customer information should be recorded?

- Importance and motivation for a desired feature or function
- Complaints recorded, field failure rate, warranty claims by feature or function
- Customer satisfaction levels product functions and features or service

What should be done with this customer information?

- Determine relationship of customer requirements to engineering specifications
- Compare new performance levels against historical performance levels
- Establish design goals for new features or functions

QFD – translating the voice of the customer:

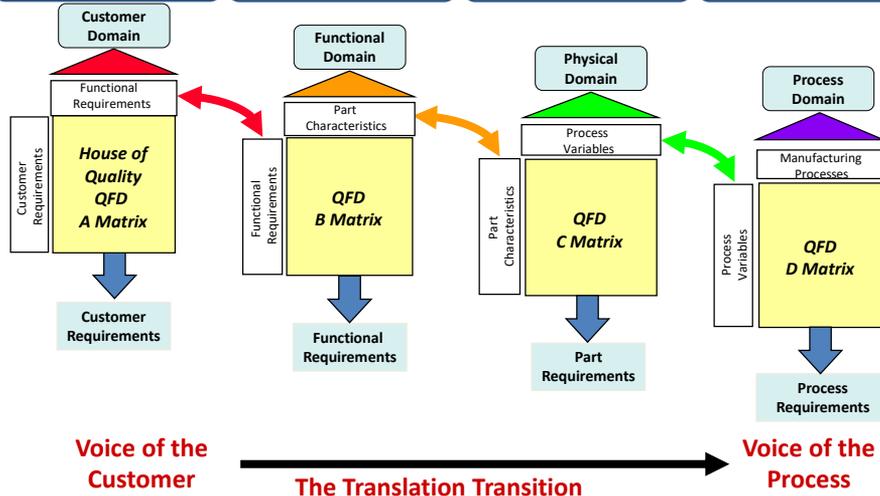
Translate requirements as qualities are deployed into a product definition:

A QFD “A Matrix” translates Marketing Features into the Engineering Functions

A QFD “B Matrix” translates Engineering Functions into Performance Requirements

A QFD “C Matrix” translates Performance Requirements into Product Specifications

A QFD “D Matrix” translates Product Specifications into work process instructions



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Using the QFD “A” Matrix:

Quality Function Deployment

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- The QFD “A” Matrix provides a means to understand how Voice of the Customer (VOC) is translated to the “Voice of the Engineer;” or how those expressed customer desires, requirements, and expectations are translated into product design requirements.
- The QFD “A” Matrix presents a logical structure for the analysis of business case requirements related to a new product design and contains elements for market and customer analysis, competitive analysis, and technology analysis.
- The QFD “A” Matrix facilitates decisions about what to include in the design based on a comprehensive understanding of how all these factors are related.

Related documents: System-level failure analysis, market and customer analyses, and business case.

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Using the QFD “B” Matrix:

Quality Function Deployment

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- The QFD “B” Matrix transitions the technical requirements and their quantitative specification limits from the QFD “A” Matrix to create a requirements document that specifies how the hardware sub-assembly or software modules should be developed in order to meet the customer needs identified in the “A” Matrix.
- The QFD “B” matrix provides the completion of the translation of the ‘Voice of the Customer’ into the ‘Voice of the Engineer.’
- The QFD “B” Matrix is states the technical requirements using the language of each specific engineering discipline that is responsible to design the feature (e.g., electrical, mechanical, software, etc.).

Related documents: Product-level failure analysis, specific operational requirements, and high level system architecture.

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Using the QFD “C” Matrix:

Quality Function Deployment

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- The QFD “C” Matrix transitions the technical specifications for the hardware sub-assembly or software modules into requirements for the individual hardware parts or logical algorithms. At the “C” Matrix level it should be possible to specify critical, measurable parameters that must be monitored and analyzed to assure that the customer requirement is fulfilled in hardware or software.
- The QFD “C” matrix provides the completion of the translation of the ‘Voice of the Engineer’ into the ‘Voice of the Part’ or the ‘Voice of the Sub-routine.’

Related documents: Part-level failure analysis, detailed part design in drawings and specification.

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Using the QFD “D” Matrix:

Quality Function Deployment

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- The QFD “D” Matrix transitions the specifications for individual hardware parts or logical algorithms into production processes and testing methods that are used to assure appropriate quality level for the assembled system. At the “D” Matrix level it should be possible to identify control plans and requirements for process monitoring that generate consistent delivery of the original needs of the customers from the QFD “A” Matrix.

Related documents: Process-level failure analysis, work instructions, and control plan.

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The process of design coordinates requirements:



“All successes in engineering have begun with a wish to achieve something without failure.”

~ Henry Petroski, *To Engineer is Human* (1994)

“The primary purpose of things is to perform a **function**, and because the goals of aesthetics, user friendliness, and doing a job effectively can be in conflict, economics often becomes the referee. The design process is characterized mostly by tensions between the competing objectives that are resolved by **compromises**, usually driven by the realities of manufacturing cost and sales price”

~ Henry Petroski, *Success through Failure* (2008)

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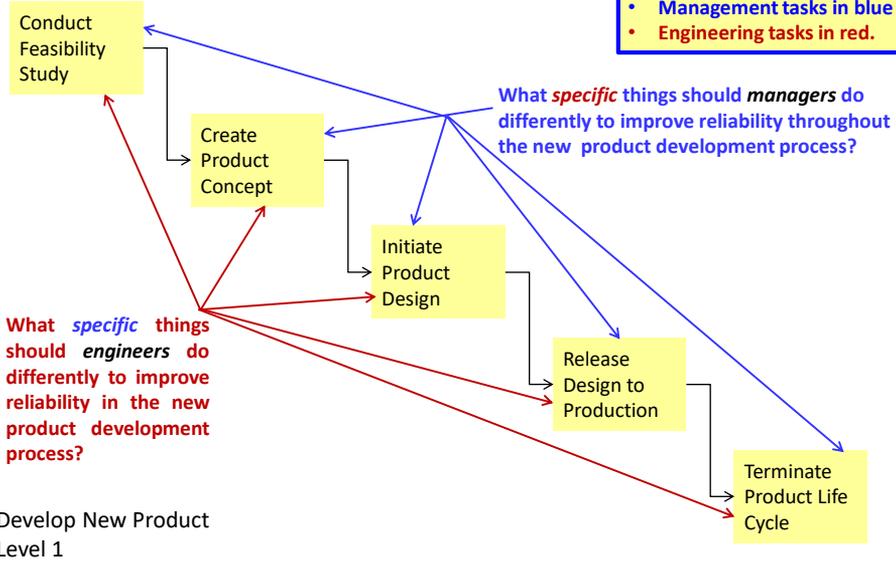
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Product Reliability Delivery Process – 1:

What are we doing to improve our product reliability?

Interpretation Key:

- Management tasks in blue
- Engineering tasks in red.



Develop New Product Level 1

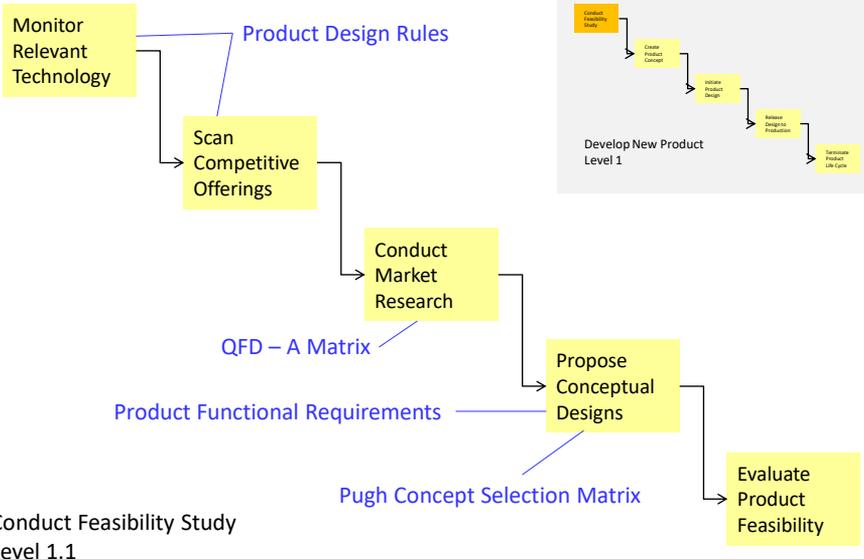
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Product Reliability Delivery Process – 2:

What are we doing to improve our product reliability?



Conduct Feasibility Study Level 1.1

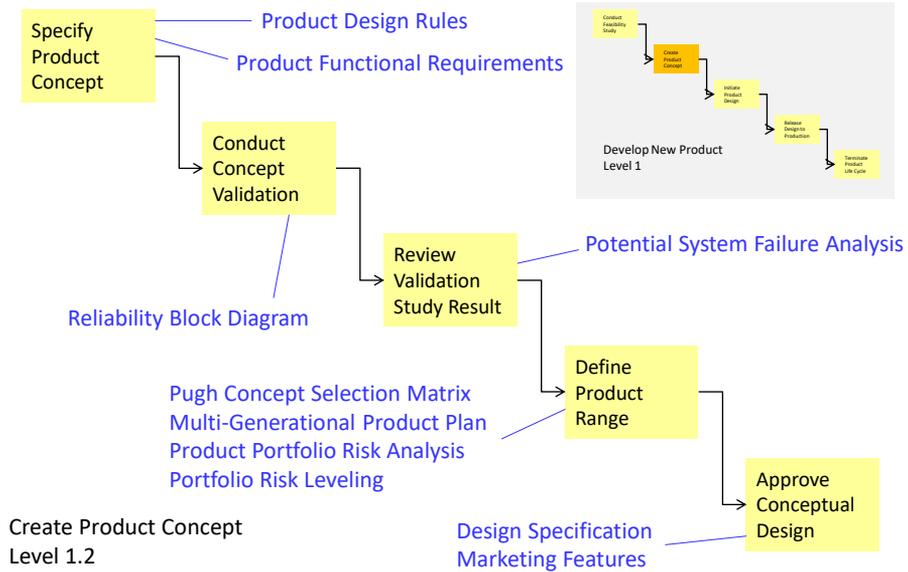
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Product Reliability Delivery Process – 3:

What are we doing to improve our product reliability?



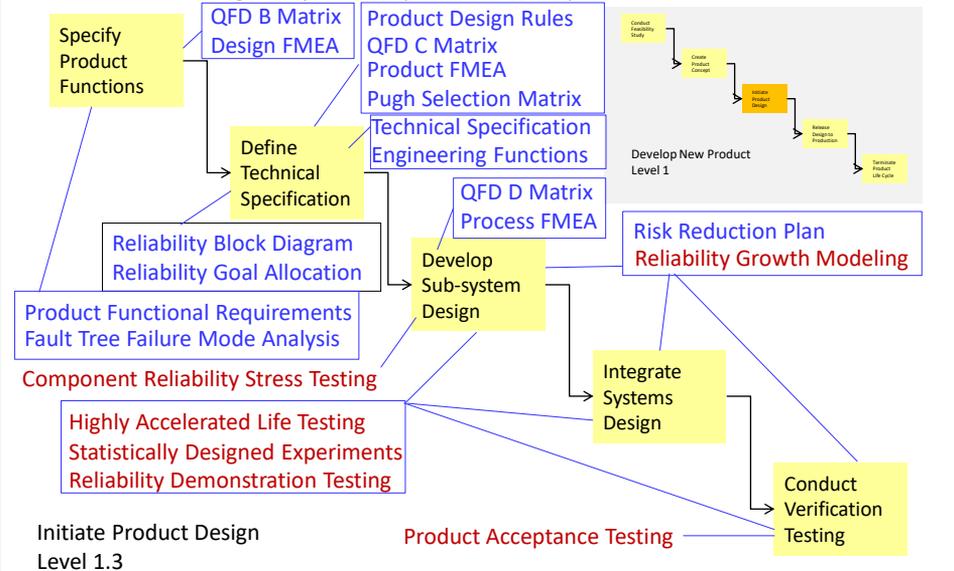
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Product Reliability Delivery Process – 4:

What are we doing to improve our product reliability?



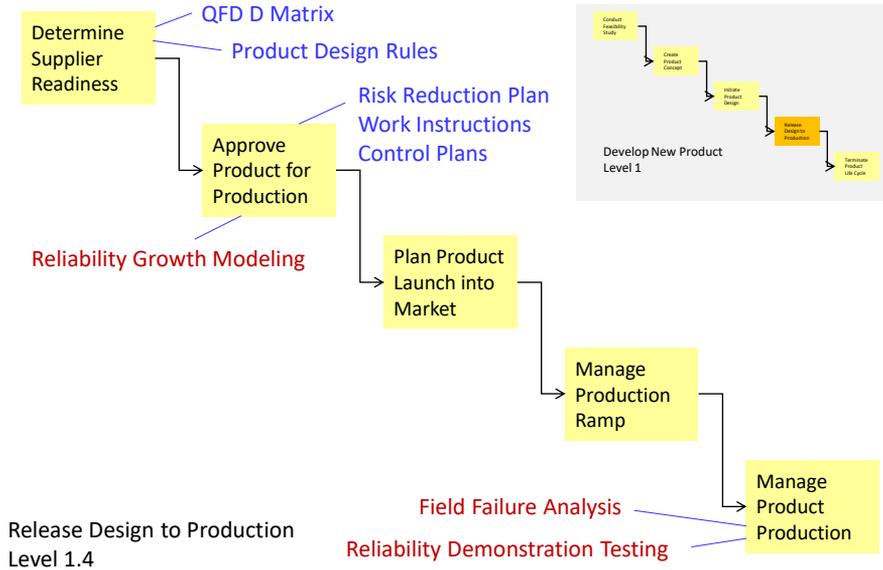
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Product Reliability Delivery Process – 5:

What are we doing to improve our product reliability?



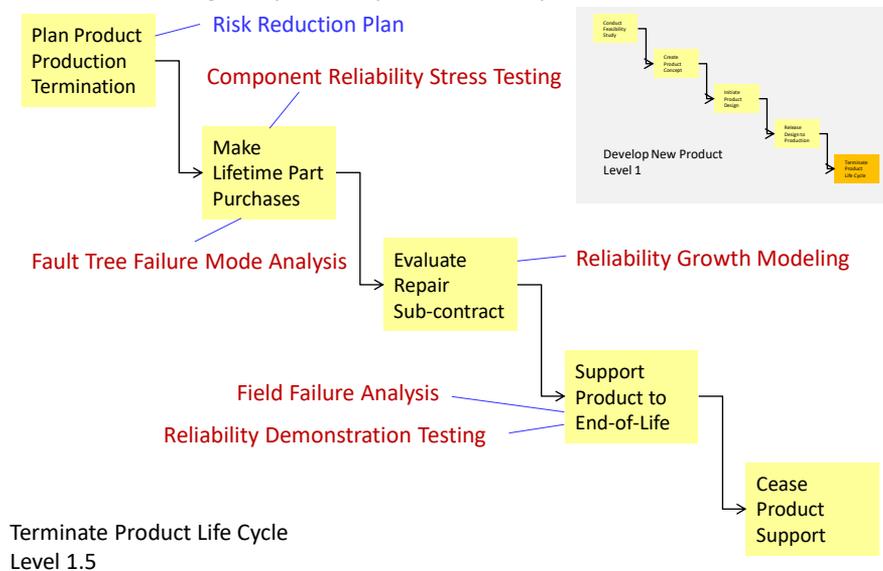
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Product Reliability Delivery Process – 6:

What are we doing to improve our product reliability?



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ANALYZING THE CUSTOMER'S RESPONSE

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What should be done with customer information?

The source of knowledge to stimulate innovation and generate insight.

- Information that your customers provide about themselves is more valuable than gold and it should be treated accordingly. This means respecting the voice of the customer and analyzing the data with integrity.
- **Respecting the VOC:** actively listen to comprehend the meaning that lies behind the words and defines the nuances of feelings that are resident in the subconscious mind of your most knowledgeable and discerning customers.
- **Analyzing Data with Integrity:** This differs from data integrity (e.g. degree of trustworthiness of the data which is a function of the measurement system, units of measure used, observation method (sampling frequency and size) as well as strategy for data storage and access. Analyzing data with integrity means converting data into information by investigating salient questions in a profound way – seeking to wring out wisdom from the recorded facts. As Nobel Laureate Ronald H. Coase said : “if you torture the data long enough, it will confess!” However, integrity doesn’t stop with just analysis. Analysis integrity also requires clear interpretation and commentary about the data observations with an intent to clarify, rather than to obscure, and sound representation of the results using clear, precise and unambiguous graphics.

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How should customer data be analyzed?

Guidelines for good data analysis to uncover potential root causes:

- Describe the question or hypothesis that is being evaluated.
- Begin the analysis by segmentation of the entire data set to describe what part of the data is to be analyzed (e.g., use a pie chart to show the full set of data with the “data slice” highlighted to demonstrate the category for a full investigation).
- Breakdown the “data slice” using data stratification into relative categories for investigation using factors or attributes that will be considered in detail (e.g., use a Pareto diagram to identify frequency of occurrence for all the observations in each category of interest).
- For a given performance variable compare the distribution of data across all the different categories (e.g., use ANOVA to describe data distributions in comparison for each set of observations within the category frequency of occurrence).
- Within each category use statistical time series analysis to investigate the historical trends looking for patterns in the data (e.g., use “individuals” control charts with pattern recognition tests to classify statistically unusual observation for detailed investigation of the event occurrence by going to the “Gemba” and relentlessly asking “why”).



MONITORING CUSTOMER EXPERIENCE

Customer Satisfaction: How does the customer feel?

What is the best way to investigate the customer's perception?

- Customer satisfaction is a subjective, relative comparison between a level of performance expectation and the degree of its perceived fulfillment by a specific customer as a result of their total customer experience.
- The traditional response is to survey customers and discover what they, on average feel about the various components of a product offering.
- However, this is fraught with problems: customers dislike frequent surveys which seem to have endless questions; customers that you want to learn about don't respond; corrective action implied in a survey may not be an effective solution to the issues raised; often, the survey doesn't care about satisfaction but is an excuse for marketing or generating sales leads; scores on the survey are not related to economic returns or future sales; standard "solutions" don't meet specific customer needs; there is no standard for satisfaction surveys so results are difficult to compare externally; surveys tend to confuse "transaction events" with the whole relationship; gaming the results and manipulating the data destroy the results; and the results are highly biased by cultural differences.
- In short, surveys don't work well to learn about honest customer feelings.

What can be learned from customer monitoring?

How well is your value proposition being delivered to customers?

- **Requirements** are really an expression of **expectation** from the customers based on specifications, warranties, advertising, and competitive claims as well as soft things: wishes, hopes, desires and dreams!
- **Performance** is really a **perception** from customers based purely on their feelings of adequacy of the results delivered to them as compared to their expectations for performance.
- **Customer satisfaction** is the relationship between the **expectations** and **perceptions** of your customers!
- Did the customer feel that your product or service helped them get the job done that they needed to be done? If so, then they will be satisfied! Why? Because it had **VALUE** – your customers felt that your deliverable was 'worth-what-they-paid-for-it' as it delivered on their expectations in the course of their experience with it.

What types of customer monitoring should be done?

Observe and record your performance at all customer touch points!

- Stratify the customer life cycle experience into potentially observable time segments and locate all customer touch points in the cycle.
- At each touch point determine what observations can be made and what types of data may be recorded. How can this data be captured and what is the best way to analyze this data to illuminate the customer experience?
- How does this process-related data relate to sales and marketing data that has been previously collected? How does it relate to service and support data captured during the on-going experience?
- Cross-plotting, correlation, and time-series analysis should be used to determine what is the strength of relationship between factors (e.g., using the R^2 statistic) and determine if one factor is leading or lagging in arrival into the customer's experience.
- "Torture the data:" attempt as many different investigations to understand how the data operates and what can be learned from sales, process, and post-process observations. How does this data relate to customer-reports of satisfaction or complaints and customer behavior with returns or switch in purchasing preferences (e.g., changing suppliers or lost-sales analysis).

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Customer-centricity is key to business success!

Introducing "customer-centricity" as a concept for alignment:

- If satisfaction surveys or quick point estimates like NPS are not considered productive ways to approach learning about customers, then how should customer insight be developed?
- The answer is: adapting "customer-centricity" into your organization's way of working as part of its operating philosophy and "role model" mindset.
- **Customer-Centricity:** the process of forging a clear understanding of the customer perspective based on collection and study of all observations at customer touch points, combining subjective and anecdotal reports with facts reported about sales, returns, complaints, field failures, interviews or surveys with estimates of financial returns that permit calculation of the "lifetime customer value" to determine the financial opportunity or threat that is caused by the relationship quality.
- Lifetime customer value may be estimated by:

$$CLV = GC \cdot \sum_{i=0}^n \frac{r^i}{(1+d)^i} - M \cdot \sum_{i=1}^n \frac{r^{i-1}}{(1+d)^{i-0.5}}$$

where GC is yearly gross contribution per customer, M is the (relevant) retention costs per customer per year (this formula assumes the retention activities are paid for each mid year and they only affect those who were retained in the previous year), n is the horizon (in years), r is the yearly retention rate, d is the yearly discount rate.

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MANAGING THE CUSTOMER'S CONCERN

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The act of recovery from failure – what's important?

What are your choices in confronting a customer concern?

“There are four ways to treat problems: **absolution**, **resolution**, **solution** and **dissolution**.

1. To **absolve** a problem is to ignore it and hope it will go away or solve itself.
2. To **resolve** a problem is to do something that yields an outcome that is good enough, that **satisfies**. Problem resolvers take a *clinical* approach to problems; they rely heavily on experience, trial and error, qualitative judgments, and common sense. They try to identify the cause of a problem, remove or suppress it, and thereby return to a previous state.
3. To **solve** a problem is to do something that yields the best possible outcome, that **optimizes**. Problem solvers take a *research* approach to problems. They rely heavily on experimentation and quantitative analysis.
4. To **dissolve** a problem is to eliminate it by *redesigning* the system that has it. Problem dissolvers try to **idealize**, to approximate an ideal system and thereby do better in the future than the best that can be done now.”

~ Russell L. Ackoff

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Customer concern: how to respond to things gone bad?

What should be done with a customer problem? Confront it!

Invoke a Corrective Action/Preventive Action (CAPA) process:

- First, **define and diagnose the problem**: diagnosis is complete when the root causal system has been discovered and it is possible to evaluate the contribution of potential causes to the problem observed in the dependent variable.
- Second, **contain the problem**: containment is considered to be effective when the problem is no longer spreading to have an effect on additional customers.
- Third, **correct the problem**: corrective action is considered to be effective when the problem is no longer occurring.
- Finally, **prevent the problem recurrence**: preventive action is effective if it is no longer possible to generate the problem.
- Complete the job by updating the work instructions, training employees in the revisions, and seeking continual improvement of all processes that arouse customer concern.

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ASSESSING CUSTOMER SATISFACTION

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Which customer behaviors do you want to influence?

Satisfaction relates to short-term experience; loyalty to the long-term.

- Satisfaction inquiries occur relatively frequently and are focused on short-term events that are in recent memory of respondents. Even when a long-term question (such as those related to overall satisfaction, willingness to recommend, or willingness to repurchase) is asked, the bias is toward giving a response from short-term memory. Additionally, satisfaction surveys are dedicated to singular relationships and not industry comparisons, so the customer is not presented with an “either/or” choice among alternatives with the same degree of consideration, but is biased toward selecting the company that he has been reviewing. Thus, satisfaction surveys do not give unbiased estimates of long-term customer economic behavior related to their future choice.
- Loyalty, either to the product line of a brand or to customer repurchase of a specific product, is not a simple relationship that can be measured by ANY question that has a discrete type of response (either scalar or binary (i.e., yes/no, true/false). Consumer choice is influenced by numerous different events, and many may be outside the control of the company (e.g., social, political, regulatory, industry, or market shifts that bias decisions).

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Measure using “net promoter score” (NPS)?

What about Harvard’s Net Promoter Score (NPS) – is it any better?

- First, NPS is developed from surveys and suffers from the same problems as do traditional customer satisfaction surveys. The NPS calculated for an organization is the percentage of customers who would recommend the company (the promoters) minus the percentage that would urge others to find resources elsewhere (the detractors).
- Harvard’s Frederick Reichheld claims that the answer to a single question is the only number organizations need for measuring customer loyalty and that it can be used to grow the business.
- This claim is highly questionable as NPS is based on perception knowledge only and suffers from a number of related issues: perceptions of individual customers are not additive; cultural biases exist between respondents to a survey; perception data is not balanced with performance reports about actions in the customer domain; and scalar choices for the promoter and detractor categories are arbitrary and not supported by detailed statistical validation.
- Thus, the proposed **NPS** score is **not recommended** as a single indicator of customer loyalty and a multi-factor approach is recommended instead.

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Reporting on customer satisfaction:

$$\text{Satisfaction} = \frac{\text{Performance Perception}}{\text{Results Expectation}}$$

Guidelines for less-biased, more accurate reporting:

- Present all the data, not a single numerical index or summary indicator, to describe the quality of relationship that the company has with customers in various situations. Do not rely on summary data or “average” response to portray meaningful information.
- Report both objective and subjective data with trends and comparisons to external organizations to boost the opportunity to decrease interpretation bias (e.g., compare internal reports to the European Customer Satisfaction Index (EPSI) by industry and nationality of customer).
- Track trends by metric to determine if there are changes over time in the perceptive sensitivity of the different customer categories as segmented by product line and gradation in customer value.
- Seek to determine the drivers of expectation that are external to company control and monitor them regularly to remain informed about changes in their behavior.



GENERATING CUSTOMER INSIGHT

Designing a customer-oriented business:

The business value of customers increases in direct proportion to how easy it is for them to do business with you.

How to build stronger customer relationships? What works well in operating such a customer-oriented businesses?

- Target the right customers
- Own the customer experience
- Streamline processes that impact the customer
- Provide a 360-degree view of the customer relationship
- Let customers help themselves
- Help customers to do their jobs
- Deliver personalized service
- Foster a sense of community with customers

Customer Insight:

SUMMARY:

- Customer insight is the gathering and integration of information on the customer preferences, behaviors, expectations as well as all of the phases of the customer experience from acquisition through the end-of-life cycle.
- Obtaining a coherent understanding of customer behaviors relative to company actions allows an organization to better structure their marketing strategies and product differentiation or positioning in the market as well as setting price points that take advantage of the price elasticity of customers for the given offering.
- Customer insight is an essential success ingredient in development of new products and in continuing service of customers in the field.
- Customer insight does: customer segmentation, market research and performance measurement, manages relationships and the corrective actions to fix complaints, product returns, or field failures, and seeks out differentiating behaviors that will provide competitive advantage.

Food for thought ...

“The most important figures are those that are unknown and unknowable. What about the multiplying effects of a happy customer, in either manufacturing or service? Is that in your figures? What about the multiplying effect of an unhappy customer? Is that in our figures?”

~ W. Edwards Deming

Thank you! Any questions?

BUSINESS EXCELLENCE SOLUTIONS





Part 5: Systems for Quality Development

BUSINESS EXCELLENCE SOLUTIONS



1

So, what is quality?



“Quality ... you know what it is, yet you don’t know what it is. It is self-contradictory. But some things **are** better than others, that is they have more quality. But when you try to say what quality is, apart from the things that have it, it all goes **poof!** There is nothing to talk about. But if you can’t say what Quality is, how do you know what it is, or that it even exists? If no one knows what it is, then for all practical purposes it doesn’t exist at all. But for all practical purposes it really **does** exist.

“Most people would have forgotten about Quality at this point, or just left it hanging suspended because they were getting nowhere and had other things to do.”

“You look at where you’re going and where you are and it never makes sense, but then you look back at where you’ve been, and a pattern seems to emerge. And if you project forward from that pattern, then sometimes you can come up with something.”

~ Robert M. Pirsig

Zen and the Art of Motorcycle Maintenance

2

What have we learned about quality so far?

Systems for Quality Development:

- The **“Theory of Attractive Quality”** describes how customer insight drives quality and the role of innovation and standardization in managing customer requirements.
- The **“Quality Delivery Model”** describes the process for transformation of creative ideas into practice and achieve excellence by execution of achieving reliability by design and managing for quality.
- The **“Triple Loop Learning Model”** describes how organizations develop learning at all levels to encourage quality behaviors in daily operations and concurrently focusing on gaining strategic advantage through continual improvement.
- The **“Structured Innovation Process”** describes how behavioral approaches can be used to encourage generation of innovations.
- The **“Customer Requirements Matrix”** describes an approach for active listening to the various perspectives of stakeholders in the process for innovation generation of new product concepts.
- The **“Process of Management”** describes the inclusive process for engaging people in teams for continual improvement of the daily management system.

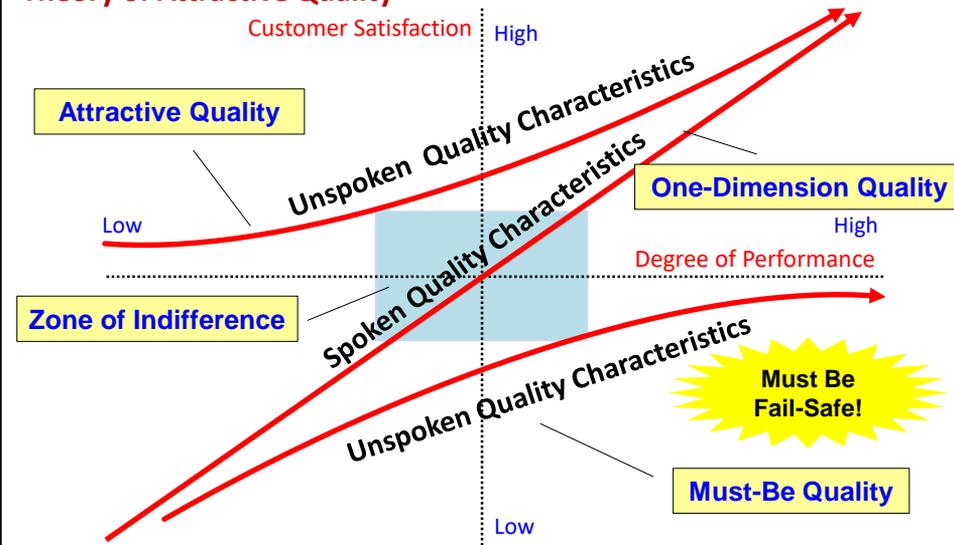
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The Kano Model for customer insight:

Theory of Attractive Quality

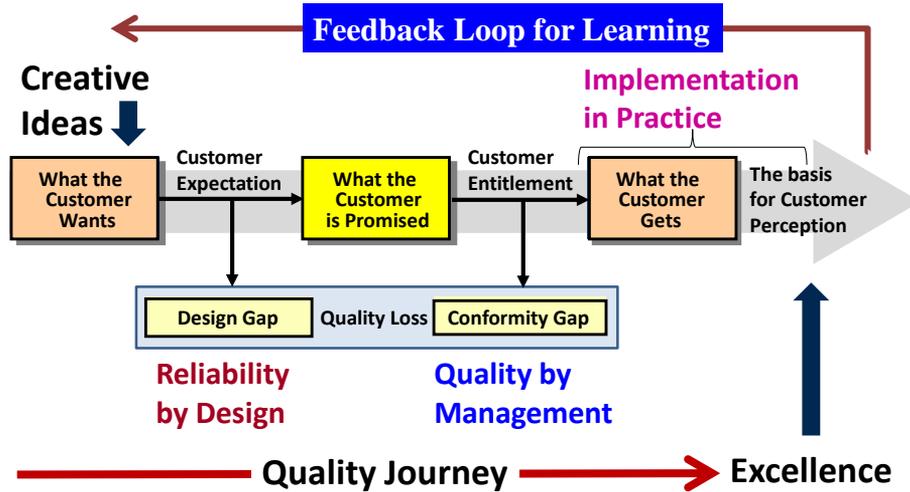


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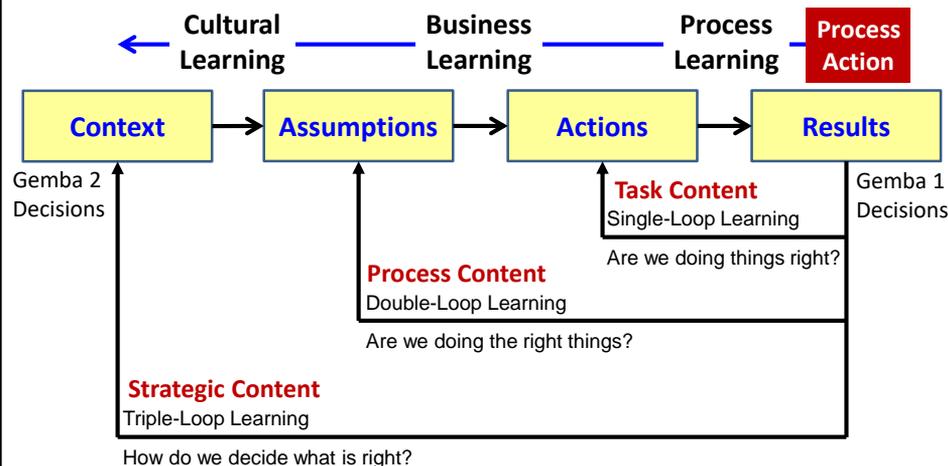
Gregory H. Watson: Transforming ideas into practice *
Quality Delivery Model



* Tito Conti, Yoshio Kondo, and Gregory H. Watson, "Competitive Quality," *Quality into the 21st Century* (ASQ Quality Press, 2003).
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5

To build core competence, we must learn how to learn:



Chris Argyris, *Personality and Organization* (New York: Harper Collins, 1957).
 Chris Argyris, *Interpersonal Competence and Organization Effectiveness* (Homewood: Irwin, 1962).
 Chris Argyris, *Integrating the Individual and the Organization* (New York: John Wiley & Sons, 1964).
 Chris Argyris, *Organization and Innovation* (Homewood: Irwin, 1965).
 Chris Argyris & Donald Schön, *Theory in Practice: Increasing Professional Effectiveness* (San Francisco: Jossey-Bass, 1974).

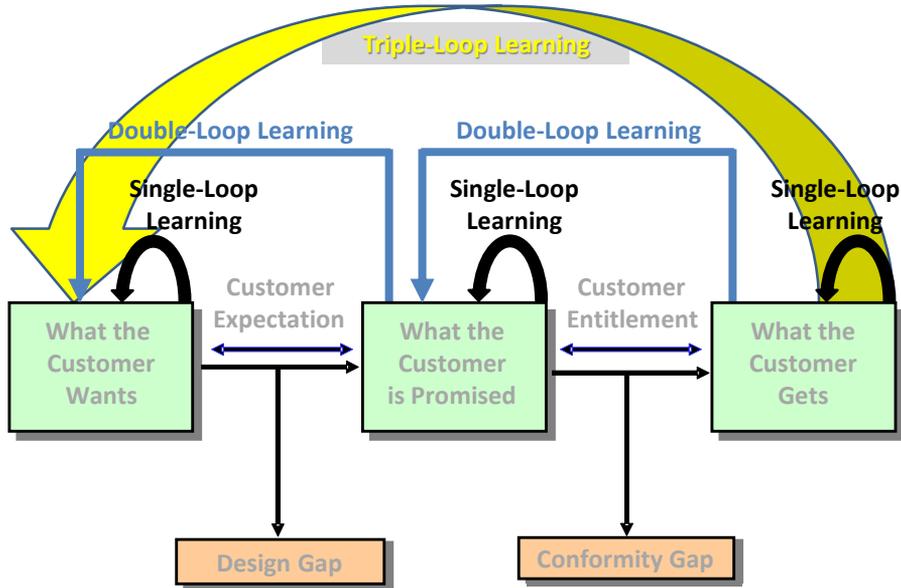
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Feedback loop specifies “Triple-Loop” Learning *

* More on the Quality Delivery Model may be found in the section on competence development.



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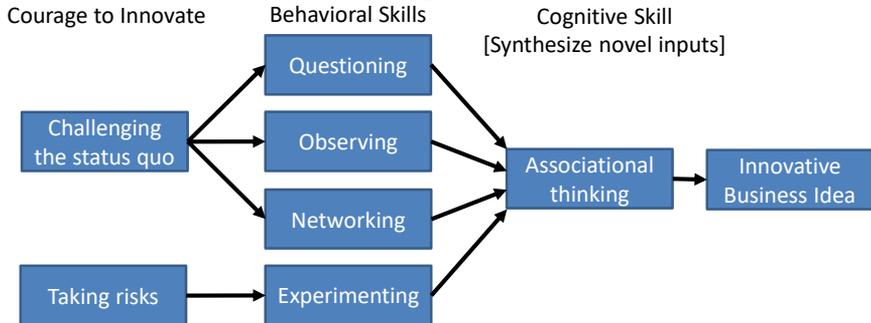
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Disruptive innovation & necessary skills of innovators:

Structured Innovation Process

Innovator's DNA Model for Generating Innovative Business Ideas *



Innovation can be developed and is capable of being converted into a process. Curious people who are willing to take (or are encouraged) to take risks can systematically develop processes that encourage questioning, observing, networking and experimenting as means to stimulate or act as catalysts for associational thinking: connecting ideas that previously had been unrelated to formulate a new concept.

* Jeffrey H. Dryer, Hal B. Gregersen and Clayton M. Christensen (2011), *The Innovator's DNA: Mastering the Five Skills of Disruptive Innovation* (Boston: Harvard University Press). More on these innovation skills in the next section on competence development.

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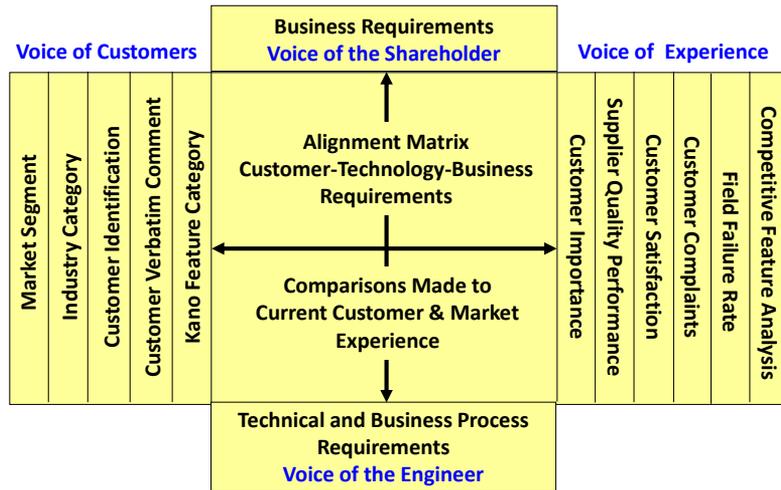
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Is there a balanced understanding of all the voices?

Customer Requirements Matrix

In concept formulation designers must "listen" to many different voices!



How do you prioritize the relative influence of these voices on design?

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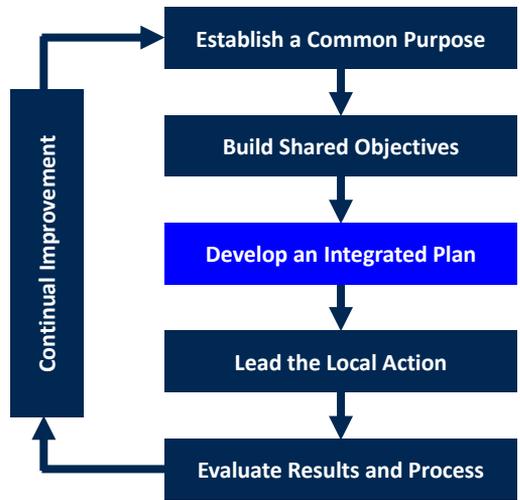
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So what is the process of managing for quality? *

Process of Management (POM)

The process of management is distinct from the content that is managed. Quality is typically associated with the content of management – it is related to performance of goods or services produced.

Quality must not be thought of as distinct from a process of management. It must be embedded throughout each activity within that process!



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

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What else is necessary to learn?

Lessons for achieving quality in the routine practice of work:

- How is quality managed in daily working management practices?
- How is quality assured through delegation of responsibility?
- How is the quality system structured to assure integration of quality in the organization and across the various types of improvement objectives?
- How are opportunities for improvement identified? How are improvement projects selected? How are these projects managed through the point of implementation?
- How does management review business processes and conduct a regular self-assessment to assure that the practices, methods, and processes of its quality management system are efficiently, effectively, economically and consistently delivering the performance desired in the business strategy?

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Forces Driving Leadership through Quality:



- Part 1: Managing for Quality by Design
- Part 2: Innovation Stimulation
- **Part 3: Competence Development**
- Part 4: Customer Insight
- **Part 5: Systems for Quality Development** ←

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Topics related to systems for quality development:



- The Improvement Obligation
- Thinking about Processes
- Thinking with Statistics
- Developing Performance Metrics
- Understanding Quality Systems
- Managing the Improvement System
- Managing Improvement Projects
- Assuring Responsibility for Quality

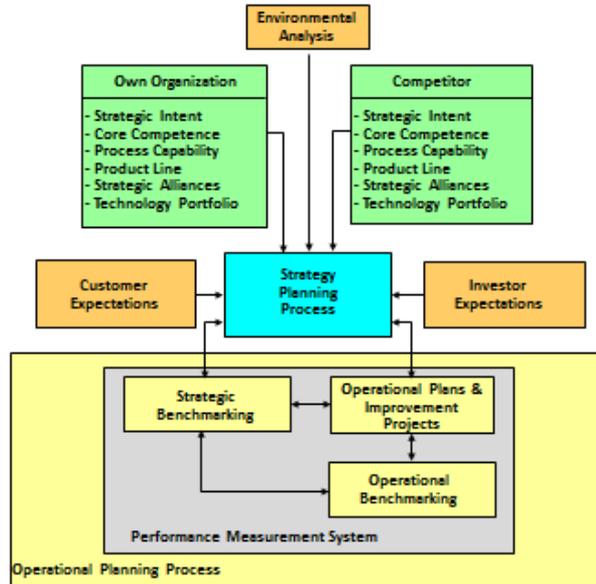
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THE IMPROVEMENT OBLIGATION

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Strategic planning – a traditional approach:



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Business System = Leadership + Management

Probing questions drive strategic inquiry:

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



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Leadership-Management dialog formulates strategy:

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

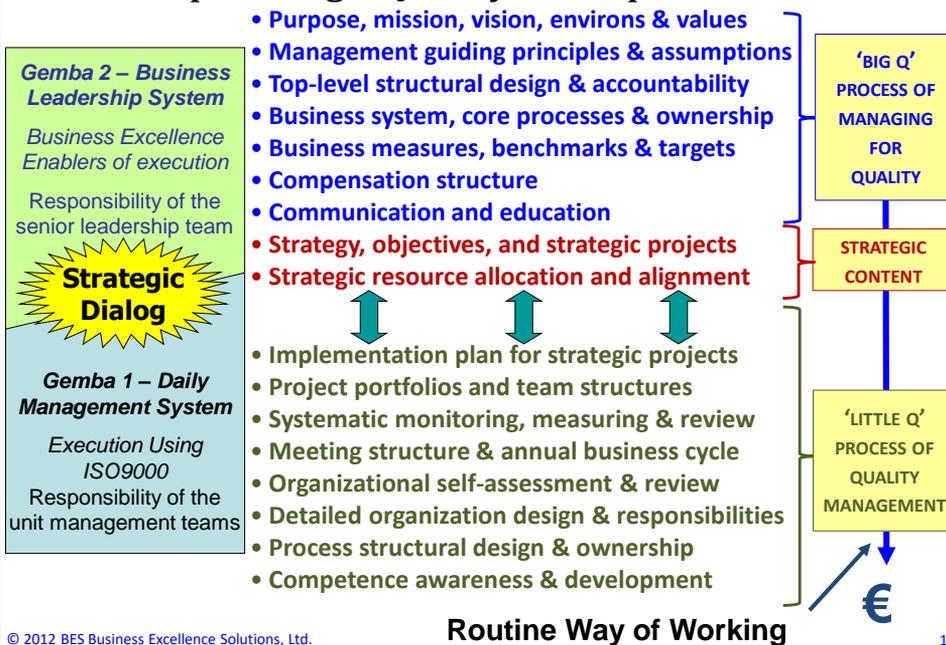


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Leadership through Quality conceptual framework:



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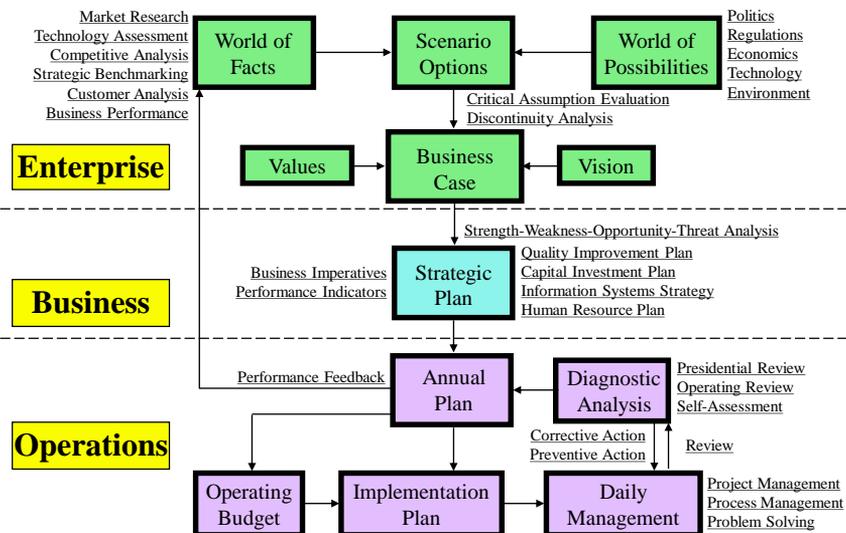
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Elements in a 'strategic dialog' process”

- **Focus Areas** – leadership’s decision identifying the critical few areas that are change imperatives.
- **Issue Statement** – an explanation of the motivation and business case for driving focus area change.
- **Intranet Team-space** – a shared location inside the organization’s intranet for working documents and related data files.
- **Blog** – a web log or open forum for recording dialog or communication in chronological order which is usually focused on a particular subject or topic.
- **Wiki White Paper** – a document that allows people to easily add, remove, edit or change contents by using collaborative software (wiki engine).

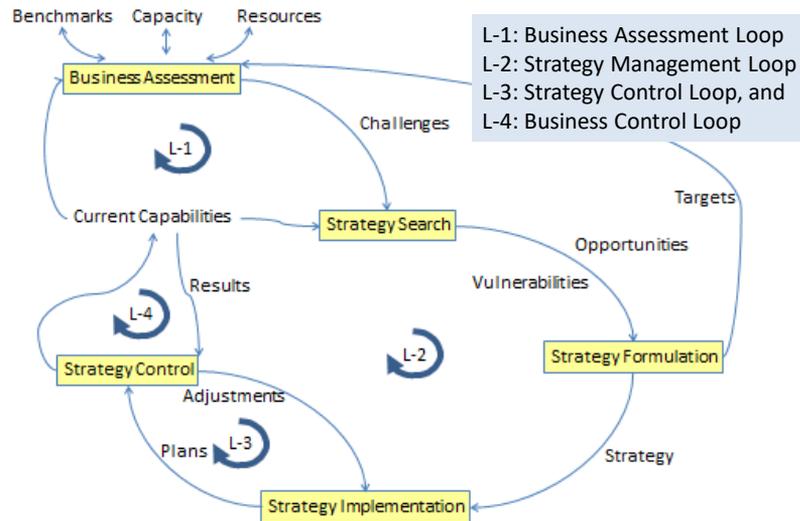
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Manage the business as a system:



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Strategic management process:



Which performance loops represent your management team's priorities?

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LSS "Recognize" phase is part of strategic planning:



Recognize activities:

- Design the organization's process architecture
- Develop the performance measurement system
- Measure organizational performance
- Determine shortfalls from targeted performance
- Identify strategic improvement opportunities
- Develop a 'portfolio' of projects to improve results
- Coordinate the projects to assure overall benefit

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What does a quality management system require?



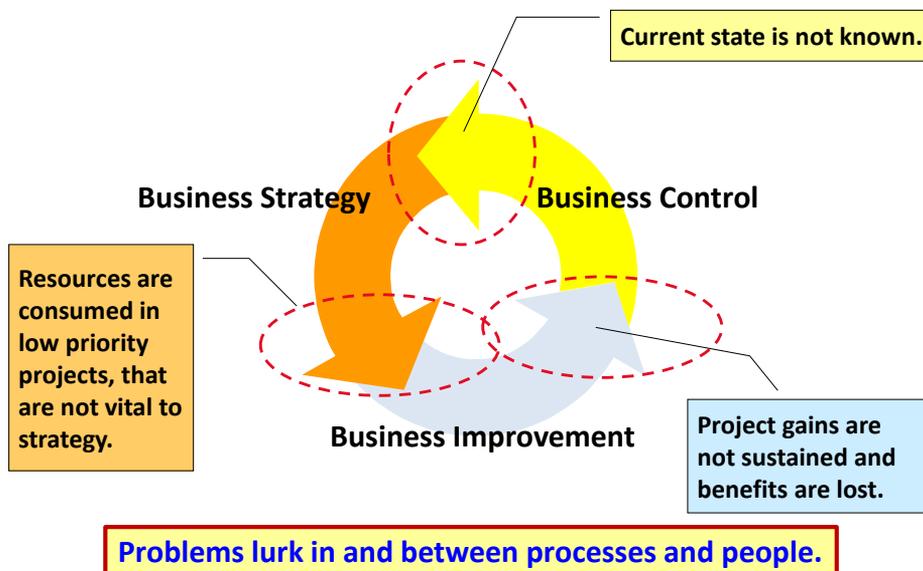
Elements necessary to get an organization “on target” include:

- Integrated planning process
- Strategic benchmarking process
- Self-assessment process
- Operational and project review process
- Business controls system
- Structured problem-solving methodology

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Handoffs create or destroy value:

It is important to master all of the key business system interfaces!



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System of profound knowledge – W. Edwards Deming:



Theory of Profound Knowledge – 1992

W. Edwards Deming (1900-1993)
The New Economics (1992)

“The theory of knowledge teaches us that a statement, if it conveys knowledge, predicts future outcomes, with risk of being wrong, and that it fits without failure observations of the past.”

“To put it another way, **information**, no matter how complete and speedy, **is not knowledge.**”

“Knowledge has temporal spread. **Knowledge comes from theory.**”

“**Without theory, there is no way to use the information that comes to us.**”

Obtaining profound knowledge of performance:

Profound Knowledge = Statistical Knowledge of Process Performance



“Profound knowledge of how a process performs is gained when you know: how a process flows; how it may fail; how it creates value; as well as why and how it changes over time.”

~ Professor Gregory H. Watson

Elements of “profound knowledge” about a process:

- **Structure of Systems:** understanding the system in which work is being done (process management).
- **Control of Variation:** knowledge of system operation comes from a study of performance variation, improvement requires the control of the sources of variation (statistical thinking).
- **Development of Knowledge:** knowledge comes by observing work, defining a theory, testing and confirming it (measurement system).
- **Psychological Impact:** human behavior must be understood, motivated and coordinated to achieve results (collaborative culture).

What is a system?

- **System:** a collection of processes that are working together to achieve a common purpose by sharing their resources for their mutual benefit.
- **Truth about systems:** they have a **purpose**; systems have competitors; systems are in **transformation** (old to new state); in systems there are independent **components** that must cooperate to achieve the purpose; the system must create **value**; a system cannot manage itself; one does not optimize a system by optimizing its component parts.
- When comparing the relationship between **cause and effect**, what is a loosely **coupled system** compared to a tightly coupled system? Does it matter? Why?
- How much **“cooperation”** is required among the components within a system? Is this **the** critical means to improvement?
- If I claim a loosely coupled system is **“stochastic”** what would it imply?

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Scientific approach to improvement methods:



Frederick Winslow Taylor (1856-1915)
“Principles of Scientific Management” (1911)

“The system must be first!”

“The greatest permanent prosperity for the workman, coupled with the greatest prosperity for the employer can...only exist as the result of the **greatest possible productivity** of the men and machines of the establishment.”

“One of the dangers to be guarded against, when the pay of a man or woman is made in any way to depend upon the quantity of the work done, is that **in the effort to increase the quantity the quality is apt to deteriorate.**”

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The “system component” in improvement:

“A system is a set of interrelated components. Each of a systems elements is connected to every other element either directly or indirectly” (Ackoff).

Physical systems are more simple than biological or social systems and the dynamic interaction between multiple types of systems must be understood so that systems of people (e.g., technocrats and bureaucrats) can share a common understanding of the total system complexity.

We tend to apply the Pareto Principle to discover the frequently occurring contributor to problems, but, in a systems world frequency of contribution is not the same as dominance for causal contribution to the overall system variation.

Jay W. Forrester, *Principles of Systems* (Cambridge, MA: MIT Press, 1968).

Russell L. Ackoff, “Toward a System of Systems Concept,” *Management Science*, Vol. 17, No. 11, July 1971.

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Theoretical approach to process control:



“Theory of Control”

Walter A. Shewhart (1891-1967)

The Economic Control of Quality of Manufactured Product (1931)

“To indicate the relationship which the **theory of control** bears to exact science, it is interesting to consider six stages in the development of better ways and means of making use of past experience. They are:

- “1. Belief that the future cannot be predicted in terms of the past.
- “2. Belief that the future is pre-ordained.
- “3. Inefficient use of past experience in the sense that experiences are not systematized into laws.
- “4. **Control within limits.** } **Statistical Process Control**
- “5. Maximum control.
- “6. Knowledge of all laws of nature – exact science.”

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The “statistical component” in improvement:

Statistical Thinking:

A process of learning and then taking action based on three following 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 keys to performance management and business improvement.**

Special cause variation is any deviation from standard process performance that can be assigned a cause. Common cause variation is the natural level of variation that exists in the process – it has no assignable cause but represents variation that is inherent in the system design.

When **common cause variation** is too great to obtain performance results expected of the process, then transformation or redesign is required.

The “knowledge component” in improvement:

There are distinct categories of facts that bias proposed problem solutions. We can observe facts using one perspective (e.g., physical), but interpret it using a different perspective (e.g., political). Thus, “managing by facts” is subject to a subjective manipulation by those who lack a shared political vision.

Limitations of Knowledge – what can we know with confidence?

Type of Data	Explanation of Data	Nature of Data
Physical data	Continuous variables (engineering quality data)	Tangible
Biological data	Ergonomic data (time and motion)	Less Tangible ↓
Process data	Timing and attribute data (pass/fail compared to criteria)	
Economic data	Approximations (estimates based on probability forecast)	More Intangible ↓
Political data	Leadership and strength of relationship (fixed scale/rank)	
Social data	Interactions or relationship (group norm relativity)	
Moral data	Values or personal philosophy (individual relativity)	Intangible

Chester I. Barnard, *Functions of the Executive* (Boston: Harvard, 1936).

The “psychological component” in improvement:

Consider an “inverted Kano Model,” avoidance of the unattractive quality, this is what happens when a shift in motivation in Abraham Maslow’s hierarchy occurs where the fundamental need is emotive, not rational.

Driving improvement requires engagement of all combined human resources in an organization. Teamwork must become a way of working in the culture and individuals must be respected for their knowledge and encouraged to participate in improvement activities to assure the best possible result as well as to stimulate their collaboration during implementation.

Teams must cross functional and organizational boundaries to embrace the complete “informal organization” that are stakeholders in the process under improvement in order to assure maximum improvement is achieved with a minimal investment of time.

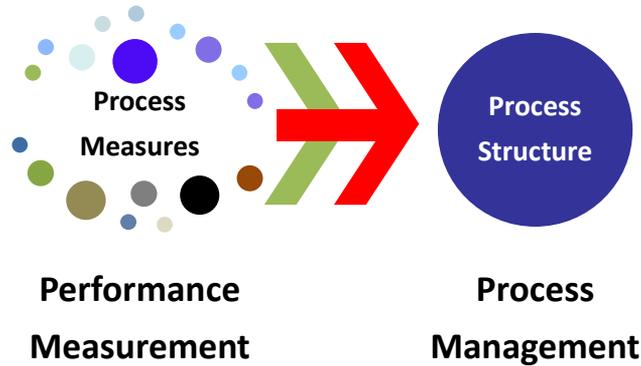
System-wide improvement require the active engagement of both managers and workers who participate in the process activities. Each must contribute in a specified role that is appropriate for their contribution.

Quality approach to mutual prosperity:

- Quality is coupled with the concept of producing exceptional value as judged by the consumers of your products and services.
- Genichi Taguchi taught that **poor quality results in a loss to society**. Noriaki Kano encouraged mankind to **pursue attractive quality**. As an outcome of these two complementary ideas, it is clear that **lack of quality causes a loss for everyone**.
- Quality is not a ‘zero-sum game’ where ‘I win-you loose!’ When we achieve high quality then we all win! It must be mutually beneficial – good outcomes for all!
- Producing quality is free, according to Phil Crosby, as the losses that poor quality causes are no longer inflicted upon society!
- Prosperity is a state of ‘economic well-being – **success** – for all the participants as process stakeholders (suppliers, organizations itself and is customers).

What is performance management?

A system of integrated process measures that are used to manage (control and improve) process activities:

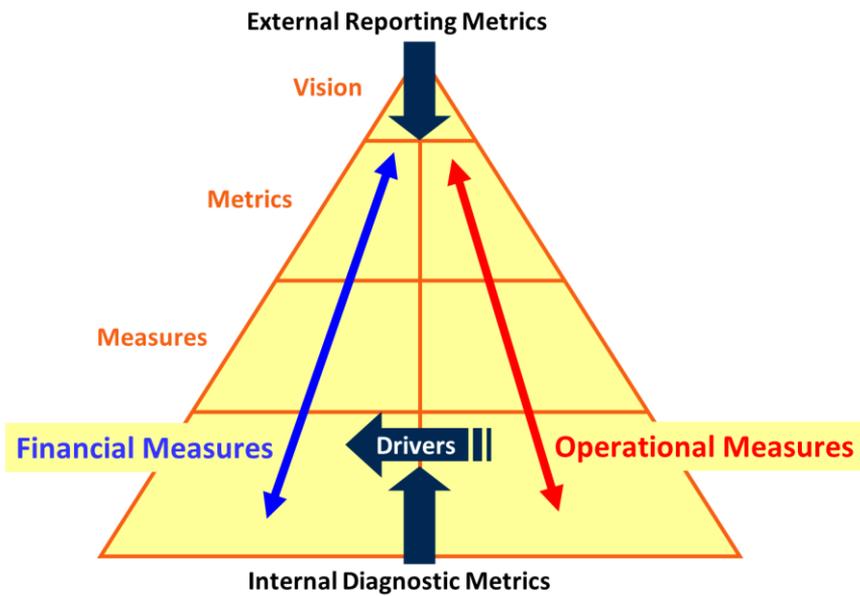


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Measurement systems must be integrated!



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What is included in performance measurement?

- What are the key tools and methods of performance measurement?
 - Operational Definitions
 - Process Mapping and Capability Analysis
 - Process Benchmarking
 - Statistical Analytics
 - Control Points, Check Points, and Service Level Agreements
- Implementation requires mastery of change:
 - Understanding the logic of causation (correlation plus ...)!
 - Physical relationship, statistical relationship and logical congruency!
 - **Necessary:** factor must be present to have an effect
 - **Sufficient:** it is enough when this factor (or set of factors) is present to assure that the result occurs (necessary and sufficient condition).

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Linking reporting metrics with diagnostic measures:

$$Y = f(X)$$

Corporate

Shareholder Value-added
Brand Value-added

Consolidated Reports



Diagnostic Analyses

Business Unit

Deliver to Promise (Service Level Factors)
Customer Loyalty (Customer Behavior/Product Churn)
Profitable Market Growth
Productivity Optimization

Operations

Process Capability
Process Defects
Activity-Based Process Cost
Cost of Poor Quality
Process Productivity (Rolled Throughput Yield)
Process Efficiency

$$Q - C - T$$

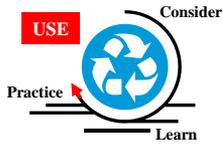
Customer Satisfaction (Service Components)
Employee Satisfaction (Working Environment)

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Cultural transitions required in revised quality system:



- **Management philosophy:**

Flawless execution in consistently delivering excellence to our customers!

- **Scientific analysis methodology:**

This structured approach will rapidly resolve problems and innovate in process!

- **Process measurement:**

Statistical measures of process quality will enable improved work performance!

- **Business culture:**

Teams will manage with data and develop intolerance for unwanted variation!

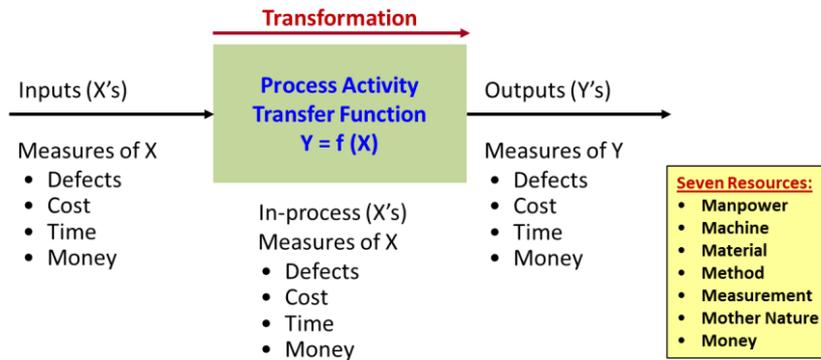


THINKING ABOUT PROCESSES

What is a process?

A **process** is any series of activities that transforms 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 the process improved and controlled using statistical methods to assure austere consumption of resources.

Process defines the relationship $Y = f(X)$:

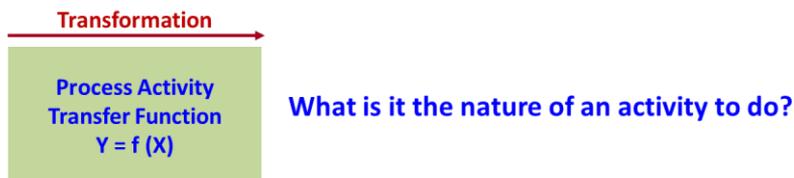


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Processes take action or make decisions:



- Activities have two basic functions: either to transform inputs into outputs or to make decisions about process performance.
- Activities that formulate transformations are called **work processes**.
- Work processes may be divided into more compact **sub-processes**.
- Work processes will terminate in a work instruction, procedure, or a device (e.g., software or machine) whose actions are explicitly defined. This determines the end of the process model.
- Activities that control routing of flows and work are called **decisions**.
- The sequence of work processes and decisions that generate final work output is defines a **business process**.
- Business processes are linked together to achieve an overall purpose.

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How is value modeled in a process?

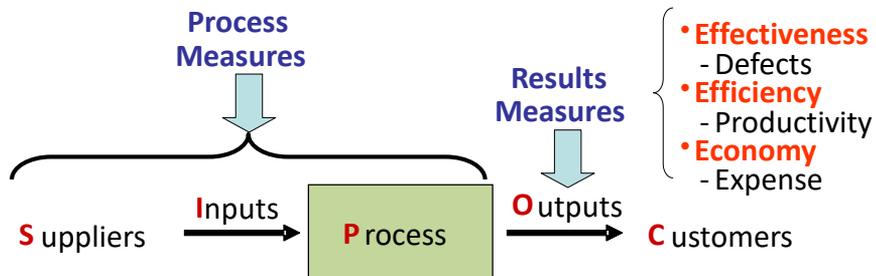
- **How to think about it?** Each step in a process adds (or reduces) value that is produced by the process.
- **How to do it?** A process model can be created that describes consumption of time, quality of throughput, and cost of transactions made in its activities.
- **How to use it?** The model of how a process produces value can be used to identify where it produces waste and prioritize where to improve it.
- **How to read and interpret such a model?** Work is performed by a person identified in a “swim lane” and performance is described by the data related to that process item in the value stream below each activity’s symbol.
- **What questions to ask?** Where is the most process waste produced? Where is the process bottleneck? How much does each activity cost?
- **What is the next step?** Conduct a failure analysis of the process, determine the relationship among performance measures and conduct an exploratory analysis of the process performance data.

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Processes require end-to-end performance measures:



Measurement questions:

- How good is our measurement system?
- How should we measure our current performance?
- What is our current performance level?
- How good could our performance be?

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Learning about the flow of value in a process:

Understand the “Value Stream” of the process activities:

- As a process consumes resources, it also has an opportunity to waste them!
- Value must be measured in money or money-surrogates (time or productivity).
- Consistent measures must be taken at each process step and accumulated to describe the total process cost and to identify its waste:

Total Cycle Time

Value-Adding Time (VAT) – process time that is worth its effort

- Increases the value of a product
- Must be done right the first time
- Transforms the form, fit or function to customer requirements
- Something the customer cares about

Waste: the use of a material or resource beyond what your customers require or are willing to pay.

Required Time – necessary work required of the organization

Non-Value-Adding Time (NVAT) – process waste

- Rework
- Movement
- Transportation
- Waiting
- Overproduction
- Unnecessary Inventory
- Inappropriate Processing
- Under-use of human resources

Value Stream Measures

Effectiveness = RTY

Efficiency = AΔT

Cost per Transaction

$$\text{Process Efficiency (A}\Delta\text{T)} = \frac{\text{Value Adding Work Time}}{\text{Total Process Cycle Time}}$$

Strategies to deliver value in processes:

- **Value Adding Activities:** The operating strategy that is used in value-adding processes should be to **optimize** performance results.
- **Required Non-Value Adding (NVA) Activities:** The operating strategy that is used to improve required NVA activities should be to **minimize** loss in such activities while **meeting** required levels of performance.
- **Non-Value Adding (NVA) Activities:** The operating approach used to improve NVA activities that should be to **eliminate** them, wherever it is possible, or minimize them wherever it is not possible to eliminate them.

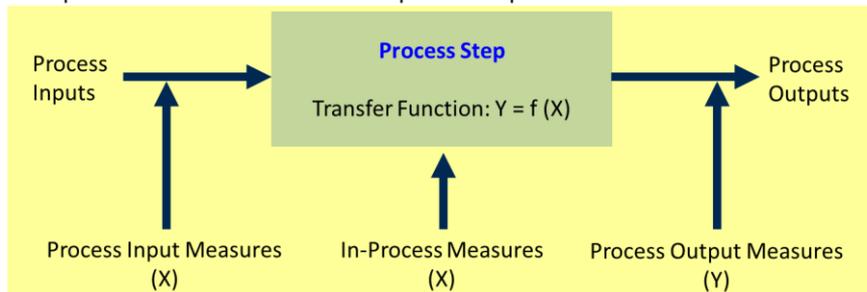
A process is only as strong as its weakest link!



- Processes sequence activities to deliver an overall output or results to customers.
- Process performance can be measured in terms of rate of successful performance (yield or defect-free results); cycle time to perform the process; and cost per transaction through process sequence.
- Process productivity is output divided by effort and success occurs when salable throughput increases while the cost per transaction decreases.
- However, since the process is a sequence of events which must all succeed – it must have a bottleneck!

Conducting the search for 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.

Measures describe the performance across flows:

What should be measured in a process model?

- **Activity output level:** the total number of units that transition successfully through the process flow without defects; where defects indicate a lack of ability to meet targeted quality level as agreed with customer for process results.
- **Productivity:** the number of successful units produced during a specified time increment of production effort.
- **Distance Traveled:** distance traveled during the process of production by a single part from the initial step to the final step.
- **Rolled Throughput Yield (RTY):** probability of successful completion of a series of process steps performance
- **Cycle time:** the time required to successfully complete all of the step in a process and is analyzed by tracking the flow of a single unit.
- **Total Cycle Time:** the time from process initiation to the successful completion of the last step in the process.
- **WIP Inventory:** units of Work-In-Progress in the production line flow.
- **Transaction Cost:** the sum of all direct costs to effect a total process transformation.
- **Loaded Transaction Cost:** the sum of direct and indirect transaction costs, including allocated overhead.

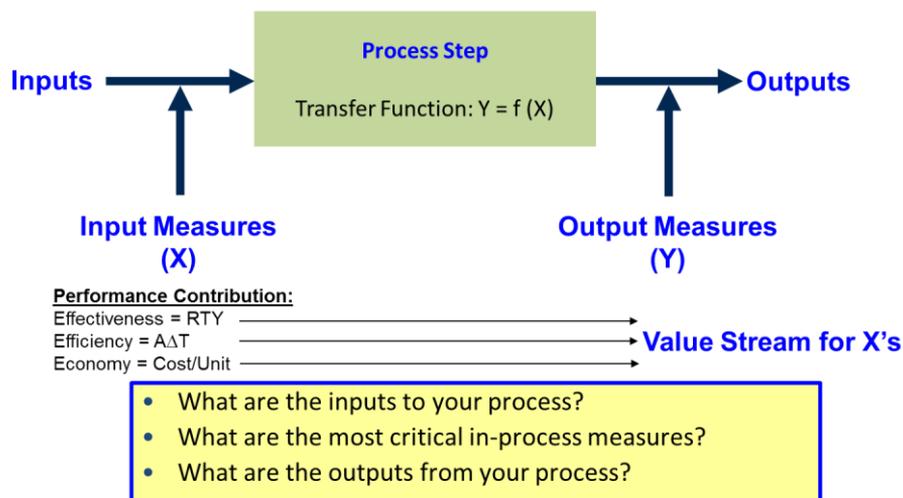
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Measuring the flow of value in a process:

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

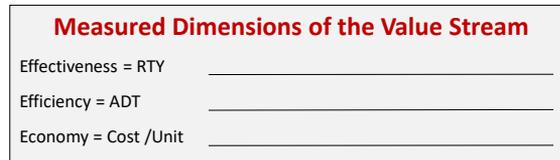
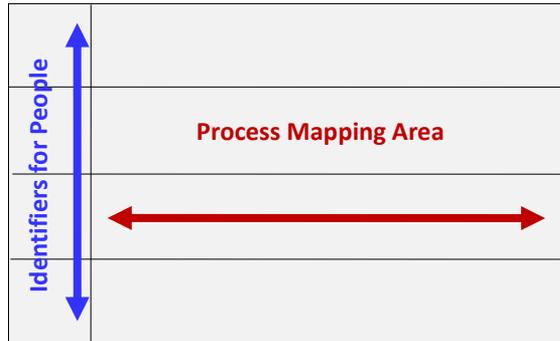
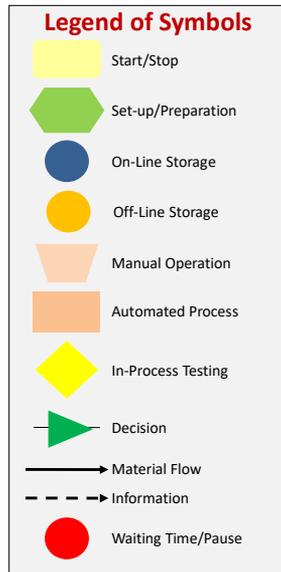


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Use standard symbols so VSM is a common language:

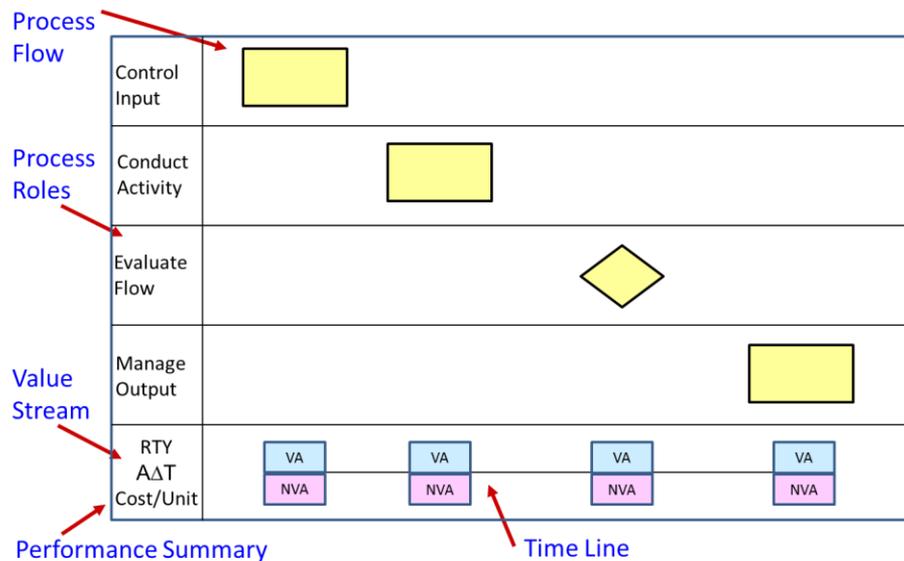


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Graphical picture of a value stream process model:



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How do organizations operate using processes?

- **Now that we know what a process is, what is a process organization?**
- **How does a process organization differ from a traditional structure?**
- **Why is a process structure valuable?**
- **How does a process organization help to enable capacity development?**



- Process organizations structure their work using an end-to-end approach where activities that create value for customers flow from understanding customer requirements through the successful delivery of capability that helps customers “get their job done.”
- Process organizations work across all functional and geographic boundaries to deliver results by collaborating in a flexible and efficient manner based on a shared motivation to deliver an excellent result to customers.

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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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Determining your maturity level in process thinking:

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 maturity in process management?

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

What occurs at process maturity 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.

What occurs at process maturity 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.

What occurs at process maturity 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 oversight responsibility to the current functional managers. In the matrix type of organization this creates a complication: process owners may not have the authority to assure compliance to process standards across geographic or business unit boundaries, so process management becomes limited to the ability to 'suggest' good practice, rather than 'assure' common practice across the organization. Thus, process "ownership" occurs more in name than in practice, although there may be informal cross-functional networks established for sharing best practice, compliance cannot be required.

What occurs at process maturity level 4?

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

This step requires a transitional phase as functional managers are typically reluctant to surrender their delegated authority. Business leaders often do well to assign experienced functional managers to positions of process owner to signal the importance and superior authority of this role.

In addition, authority is typically transferred in steps to the process owner: starting with cross-functional definition of a common process description, and then adding in sequence responsibility for: process measurement systems, information systems definition, competence development, facility standardization and budget control. Local operations managers are responsible for the execution of the process and participate in networks to improve and coordinate activities across regions and business units.

What occurs at process maturity level 5?

The initial focus of newly assigned process owners is to develop a common definition and understanding for the process, so projects are initiated that will result in the production, testing, and approval of formal process model descriptions that identify the assigned processes.

Activities that should be 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 of the “as is” state of activity; sharing the publication of draft models for review by operations managers who act as local managers for the process 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 a future project for performance improvement of the process. Closure of this step will not result in having common processes, but in a standard process with deviations from that process identified across the organization at each location which uses this process in its work activity.

What occurs at process maturity 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 – a measure 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 the 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 indicators and all decisions in the business must identify the 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.

What occurs at process maturity level 7?

Following these six steps then work processes can be effectively linked to business processes and the performance of the daily process management activity can be used to determine progress toward accomplishment of the key business performance indicators.

At this stage in process maturity a comprehensive process model of the key business functions and core processes exists. Management must be capable of viewing the model according to different perspectives 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, then management has a new tool for controlling and directing the organization. Performance simulation is a possibility as the result of activities accomplished are monitored through the flows using the process performance measures.

What occurs at process maturity level 8?

A major change in management occurs with establishment of chartered projects to address specific dysfunctional areas identified in the business process model. Improvement projects are launched based on deficiencies in the process model as identified by excessive cycle time, quality waste, or excessive cost or risk in a specific process.

Target-setting is based on the 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 the capability of reliable performance. Target-setting is systemic and assures that there are no local optimum performance silos which deliver system-wide results that are sub-optimal.

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.

What occurs at process maturity level 9?

Process modeling is moved to a strategic level where it is used as a tool of the strategic planning to assure the rationalization, harmonization as well as the alignment of organization-wide process improvement activities so that they serve the strategy of the business. This is done as part of the implementation planning for deployment of strategy.

Continuous refinement of the performance model results in a statistically valid model of the process capabilities and delivers management with an ability to define performance objectives based on 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.

What occurs at process maturity 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.

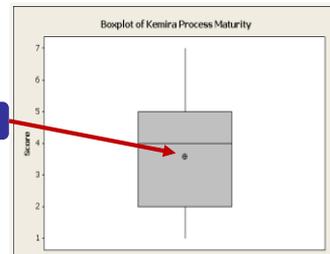
Example: Summary of process maturity survey results

An internal survey was conducted of middle managers and process owners to determine what are their feelings about the current level of maturity regarding processes:

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

Score

3.75



Company Target

Conclusion: They lack a shared discipline of process management!



THINKING WITH STATISTICS

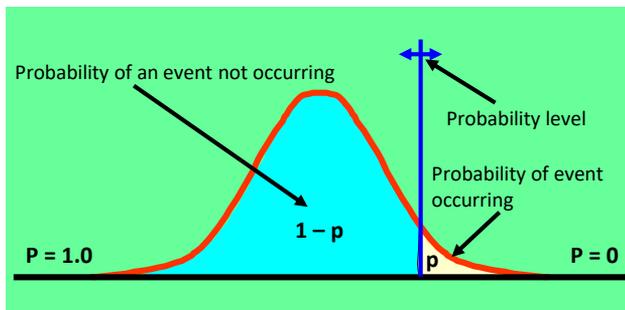
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Probability is an essential ingredient in all operations:

- Nothing, not even the laws of physics, is an absolute truth. All propositions are probabilities that are more or less likely to be true.
- Probability estimates the likelihood of an event happening or not happening. In statistics the probability of the falsehood of an event is a P-value. Typically, when the P-value is less than a decision criteria of 0.05 then the analyst rejects the chance of the event being true as there is less than a 1 in 20 chance of it being probable.



When a P-Value is very small then its truth is a relatively rare event. The decision criteria indicates how rare this could occur just by pure chance.

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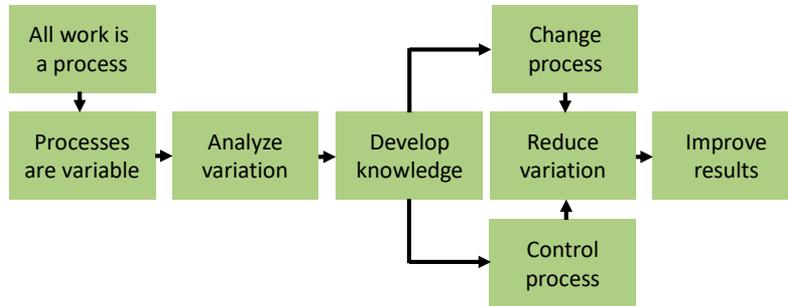
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Statistical thinking leads to profound knowledge:

A process of learning and taking action based on three underlying 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 keys to performance management and business improvement.



Objective:

Obtain 'profound knowledge' about how the process operates to improve results!

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Essential elements of statistical description:

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

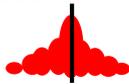
Numerical indicators of the data's location in the scale of its measurement for either a sample or a population.

OBSERVATION:

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

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

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



Dispersion of the data indicates degree of performance consistency.

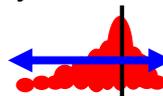
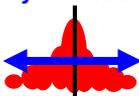
Numerical indicators in "spread" or distribution span of data across a sample or population.

OBSERVATION:

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

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

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



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Discovering sources of variation is a must!

Each sample has its own internal data distribution:

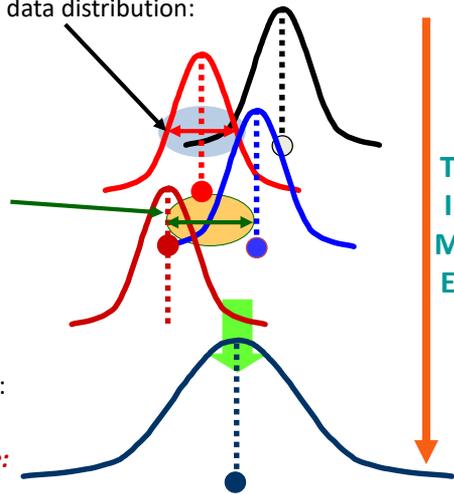
Variation "Within"
(Short-term Data)
(Common Cause Variation)

Distinctions are observable between the means of different distributions:

Variation "Between"
(Cross-sample, Short-term Data)
(Special Cause Variation)

Total observed effect over time:

Total Effect of Variation
Data observed in the work place:



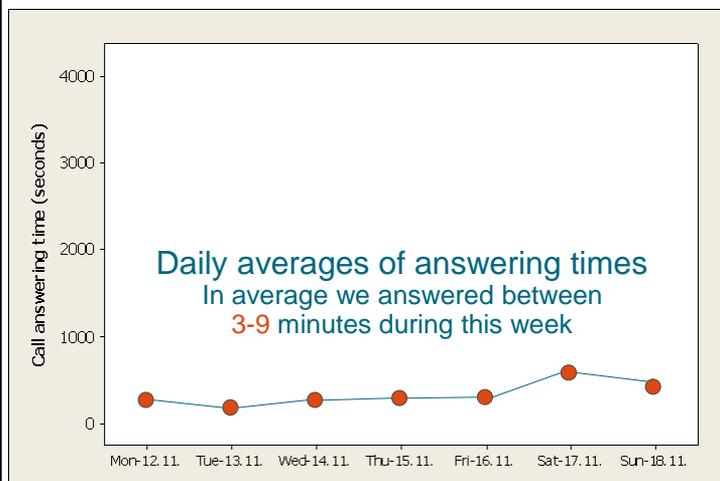
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Which approach is more reliable?

Measuring and reporting performance using averages...



Let's take a very simple example to illustrate this point!

Here is call center data from a company which was reported to its management.

What can they do with this data?

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Black Belt Training

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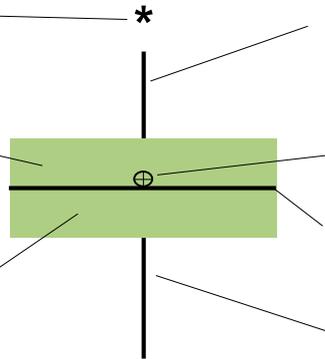
Summarizing performance over time: Box Plot

We can use boxplots (also called box-and-whisker plots) to compare and evaluate relative performance between two or more different data sets. Components of a boxplot include:

Outlier – an unusually large or small observation. Values beyond the whiskers lengths are outliers (more than 5% and each observation is shown using an asterisk).

By default, the top of the box is the third quartile (Q3) – 75% of the data values are less than or equal to this value.

By default, the bottom of the box is the first quartile (Q1) – 25% of the data values are less than or equal to this value.



By default, the upper whisker extends to the highest data value within the upper limit. Upper limit = No more than = $Q3 + 1.5(Q3 - Q1)$

Mean – an arithmetic average of all the data observations.

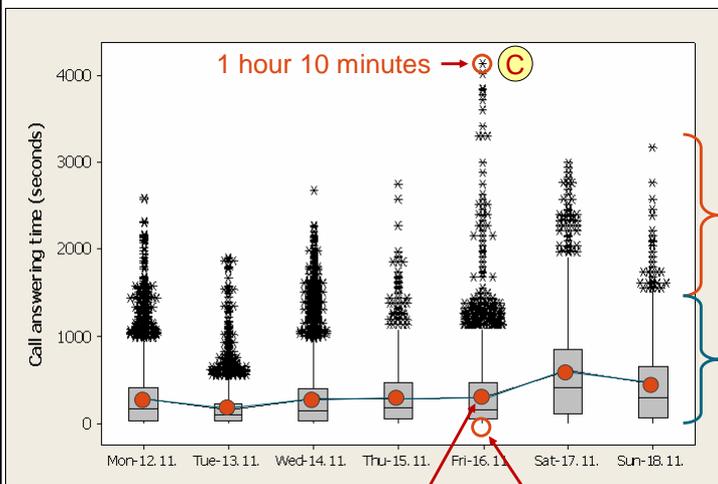
Median – the center of the data. Half of the observations are less than or equal to it.

By default, the lower whisker extends to the lowest value within the lower limit. Lower limit = No less than = $Q1 - 1.5(Q3 - Q1)$

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Which outcome creates improved results?

...or measuring and reporting facts in the Six Sigma way?



Using averages alone creates optimism and distorts quality in our business decisions!

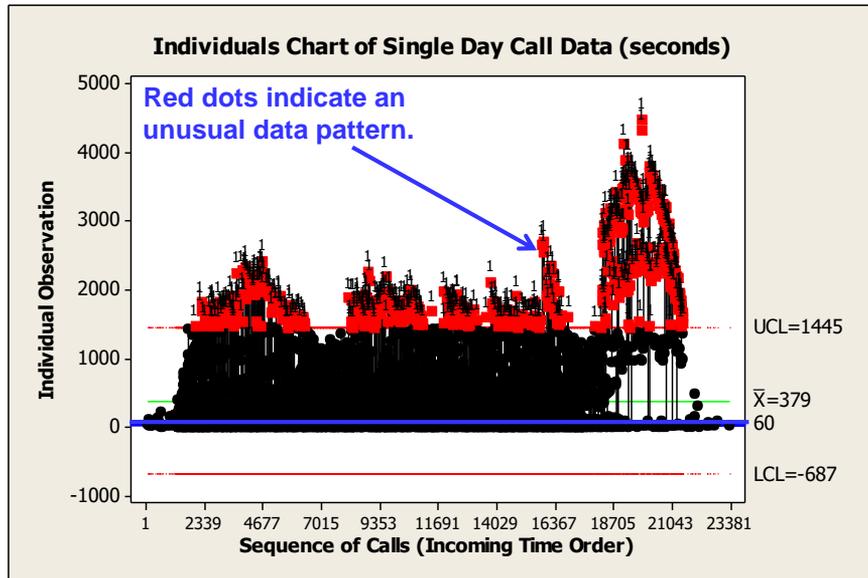
Non-predictable
Performance results that are not typical of the performance

Predictable
Performance results that fit natural process variation.

Average: 4 minutes (A) (B) 5 seconds

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Looking for patterns in Friday's raw data:



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Blind application of statistics can also distort data!

Remember: the average rarely happens – 50% above and 50% below!

- The average is a **necessary condition** to describe the performance of a process as it identifies the “expected central tendency for the location,” but **it is not a sufficient condition** to fully characterize the performance without a measure of process variation which describes the consistency of performance over time (e.g., variance, range, standard deviation, etc.).
- What do the patterns in the data have to say about its performance and what hints are “hidden” in the data about factors that could make the results better?
- Once a process has been characterized using statistics, then the decision for improving it can be simplified by using a **statistical objective** to decide how to influence the performance indicator – a process may be modified **to shift the mean, reduce the variation, or do both at the same time.**
- **The easiest way to improve a process is to discover and eliminate those factors that reduce a ‘long tail’ in an outcome metric.**

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Linking statistics to processes yields knowledge:

Profound knowledge is able to explain why patterns occur in the data.

What are “appropriate statistics” to use in analyzing process data?

- Data must indicate the location and spread of observations over time.
- Data must indicate any unusual patterns that hint at irregular performance.
- Data must be taken using measurement systems whose validity is proven.
- Data must be taken by objective operators trained in collection processes.
- Data must be presented in a manner that allows for intuitive interpretation.
- Data must be reported in graphs with numerical and narrative summary .
- Data must be reported in standard formats to permit ease of comparison.
- Data must be captured, analyzed and reported in a timely manner.
- Data must be preserved to permit diagnostic analysis if subsequent issues arise with customers that require rapid resolution.



DEVELOPING PERFORMANCE METRICS

Understanding lean perspectives ... a reflection:



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

~ Shigeo Shingo



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Data must be timely and have integrity:

Over 80% of the problems in a process relate to its own performance measurement system!

- Averaged data and similar summary statistics do not provide any useful information for discovering the root cause of the observed variation in the data.
- Observations that have excessive measurement errors (over 10% of the measured value) are not helpful in understanding trend data as it is unclear if variation is due to errors in the measurement or changes in the process.
- Data that is collected at different times and places by different people has another source of error introduced by the human factor: procedure for taking the measures; care in observing or recording the measurement; and interpretation differences with respect to the results.

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Responses to data must be swift and direct:

- Fully characterized production systems that use standard measures and have disciplined sampling control plans and ready access to the raw data have an advantage: problem investigations may be done very rapidly and corrective action can be initiated with confidence.
- Those processes that are not well-characterized suffer greatly in the case of problems: each problem occurrence begins a new process of data acquisition and requires team involvement to interpret the data and a much longer time to acquire and test potential solutions to determine if they solve the problem.
- Therefore, lean production systems must have their measurement systems and data collection and analysis plans developed at the same time that the production line is designed.

Quality characteristics of performance indicators:

- Measures must be actionable.
- Measures must be auditable.
- Measures must be standardized across operating units.
- Measures must be reliable and indicate desired results.
- Measures must be timely indicators of performance.
- Measures must be capable of validation against external systems.
- Measures must be related to defects, cost and cycle time.
- Measures must be owned by process managers and team members.
- Measures must be predictive of final results.
- Measures must reflect the expectations of all stakeholders.

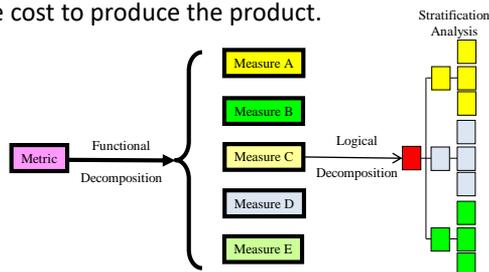
Production scorecard:

“The Toyota Production System wrings water out of towels that are already dry.”

~ Shigeo Shingo

- **A Delta T (AΔT):** Actual vs. Theoretical Cycle Time – it calculates the relative amount of value-adding time that the process produces.
- **Rolled Throughput Yield (RTY):** The result of multiplying “right the first time” yield of each process step in the series of activities producing overall results.
- **Cost per Transaction:** The total variable cost of 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.

Build up the “kernel” measures into the overall performance metrics of the entire business system.



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Data requirements for analysis and alerting:

The measurement system must be designed with the same degree of care and attention as the production system.

- Accuracy and precision of the raw data records **MUST** be objectively demonstrated and preserved in the same way that production equipment is maintained!
- In addition to **specification limits** for performance, both **alert and control limits** should be calculated and used in a real-time monitoring of key in-process performance variables.
- Preserve the raw data observations of performance for future diagnostic analysis. Summarization or compression of the data must NOT destroy the raw data!
- Also data which supports any production decision should also be preserved as a quality system record for future reference.

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Specification of a performance measure:

- Name of the performance indicator
- Linkage to stakeholder or customer
- Causal relationship between indicator and customer satisfaction
- Actionable relationship to the work process activities
- Operational definition of the measure and its defect categories
- Counting rules, computations and measurement tree
- Indication of measurement control points
- Expectation for measurement sampling and reporting frequency
- Display requirements for the metric
- Guidelines on how to interpret the metric
- Assignment of “ownership” of the metric for definition & execution

Consider: How well do we know what we know?

Ask yourself the following **measurement self-assessment** questions:

- What do we need to know? By what means will we learn?
- What measure provides this knowledge?
- What does this measure enable us to do?
- How can this information be presented for a clear decision?
- What analysis method will deliver this type of information?
- What type of data is required to use this analysis method?
- Where is this type of data available?

Designing a quality management system:

Requirement: Must have a robust approach to quality management!



- **Excellence:** QMS must identify systems for improvement that will have a strategic benefit and deliver enhancements to the customer experience.
- **Improvement:** QMS must urgently address opportunities for improvement with dedicated project efforts targeted to permanent removal of problems.
- **Compliance:** QMS must assure that daily management maintains strong compliance to work instructions and procedures while continually seeking opportunities for improvement of quality, reduction in cycle time and cost as well as elimination of waste.

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Integrating quality into the management system:

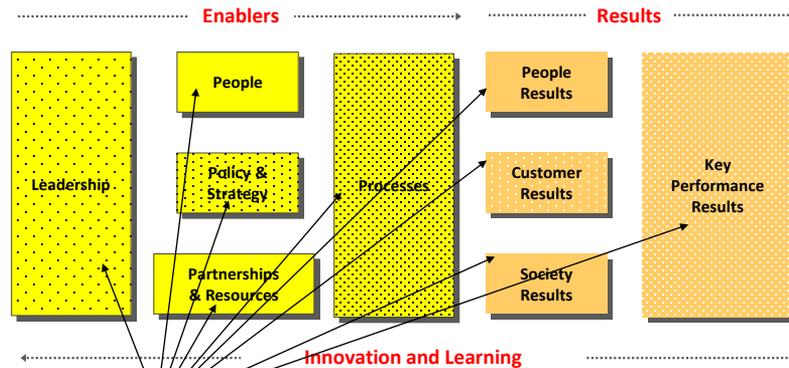


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EFQM Model for quality management: European Quality Award (EQA) Model for quality assessment:



Six Sigma influence depends on the projects that management chooses and this will influence the entire spectrum of system performance.

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Tools and Methods of Quality Management Systems:

ISO9000 Standard +	Lean Six Sigma Method +	Business Excellence
<ul style="list-style-type: none"> •Customer Management •Commercial Requirements •Work Standards •Process Mapping •Work Documentation •Control Plans •Documentation Control •Management Review •Work process Audit •Managing by Fact •PDCA Problem Solving •Basic Quality Toolkit •Basic Statistics •Corrective action •Preventive action •Continuous improvement 	<ul style="list-style-type: none"> •Exploratory Data Analysis •Variation Reduction Process •DMAIC Problem-Solving •Risk Analysis •Hypothesis Testing •Measurement System Analysis •Pull System Work Flow •Cycle Time Reduction •Constraint/Bottleneck Relief •Waste Elimination •Mistake-Proofing •Just-in-Time/Kanban flow line •ANOVA/Regression •Design of Experiments •Statistical Process Control •Visual Factory 	<ul style="list-style-type: none"> •Leadership and Governance •Strategic Linkage •Strategic Plans and Projects •Ethics and Social Responsibility •Organizational Assessment •RADAR Methodology <ul style="list-style-type: none"> •Review •Approach •Deployment •Assessment •Results •Performance Measurement <ul style="list-style-type: none"> •Business Results •Operational Indicators •Comparative Benchmarks •Knowledge Management

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Develop your QMS to meet your business needs!



The QMS is not about methods and tools – it is about management!

- The QMS must be driven by the right policy and objectives which support the business model and its development strategy.
- Quality competence must be expressly embedded into those people who fulfill critical positions that enable performance and improvement of the QMS. Specific competence requirements are a function of the business.
- The QMS must deliver on the explicit and implicit performance guarantees and support providing customers with excellence in their experience. The response to customers must be direct, honest, and timely; thus, an urgent attention to customer concerns and issues is a fundamental requirement.

Business Excellence vs. Operational Excellence:

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

What is organization vulnerability for compliance?

Matrix relating corporate quality system to external requirements:

One characteristic of an efficient QMS is its ability to satisfy all requirements for quality management that are expected of the organization. To meet this capability it is necessary to cross-reference all the relevant quality-related ISO and international standards, as well as specific customer requirements that are in addition to these baseline requirements.

One way to address this is to develop a matrix that identifies all paragraphs in the QMS (left-hand column below) and compares these to the requirements of all applicable quality system requirements (e.g., ISO, GMP, etc.) where the data in the matrix is the set of paragraph numbers where the external requirements are found in the corporate QMS.

Corporate QMS Items	ISO9001 Paragraphs	FDA GMP References	ISO14000 Paragraphs	ISO23000 Paragraphs	ISO27000 Paragraphs

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MANAGING THE IMPROVEMENT SYSTEM

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Understanding lean perspectives ... a reflection:



“The best approach is to dig out and eliminate problems where they are assumed not to exist.”

~ Shigeo Shingo



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Go to the gemba!

現場 – Genba or Gemba *

- Literally: King, surveying his kingdom, at sunset: seeing a pigsty!
- Gemba is a place of reality. It is a place where value is created.
- A place where problems are visible and improvement ideas will be generated naturally.
- Management by Walking Around (MBWA)



* Masaaki Imai (1997). *Genba kaizen: a common sense low-cost approach to management* (New York: McGraw-Hill).

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Initiating a performance improvement project:

“The problems that exist in the world today cannot be solved using the same level of thinking that has created them.”

~ Albert Einstein

First, use statistical methods to quantify process improvement potential (the difference between current state results and its ideal process capability), then chose the approach for improvement based on the degree of process knowledge and competence:

What is the current state?	Known Solution	Unknown Solution
Known Root Cause	Just Do It (Quick Win)	Kaizen Event
Unknown Root Case	Stop Guessing!	Six Sigma Project

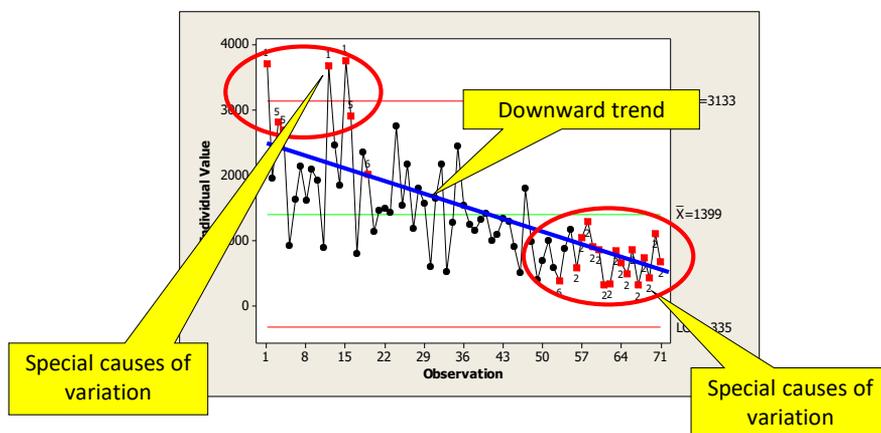
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Why is this process having a problem?

Process observation shows that there has been a change in the work!



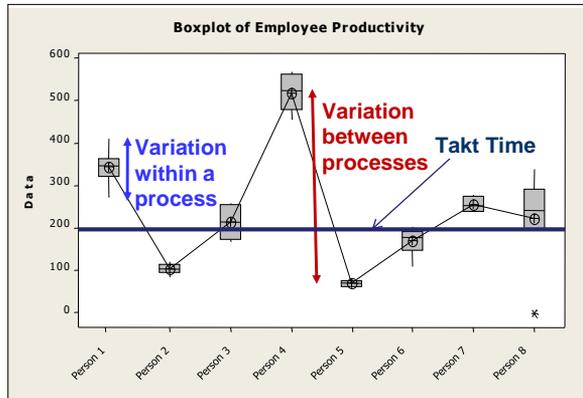
Which changes were planned and which ones were unplanned?

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Where is the problem located?



- Which person has the most variability?
- Which person is most productive?
- Which person is the most consistent?
- What would be a good follow-on analysis?

Identifies contributors to process 'red dots.'

ANOVA begins with well-chosen rational data sub-groups to create distinct separation of the sources of variation.

ANOVA displays a box plot for each sub-group that is recorded in the data (e.g., people) and shows relative variation between the sub-groups.

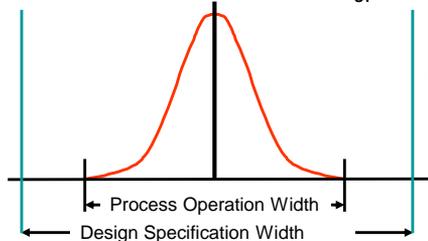
ANOVA also describes whether the differences in sub-group variation is statistically significant.

ANOVA also calculates the percent of variation that is explained by the chosen analysis factors.

How good could the process operate?

How good a process 'could' be = entitlement!

$$C_p = \frac{\text{Specification Width}}{\text{Short-Term Process Width}} = \frac{USL - LSL}{6\sigma_{ST}}$$



Variation reference is process center.

Charting options:

- Add performance target
- Add confidence limits
- Remove special causes for 'what if' analysis

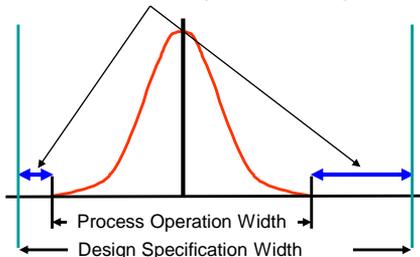
Measurement Value = Nominal is Best

$$\text{Capability} = \frac{\text{Voice of the Customer}}{\text{Voice of the Process}}$$

Measurement = Cycle Time

How good a process 'is' = performance!

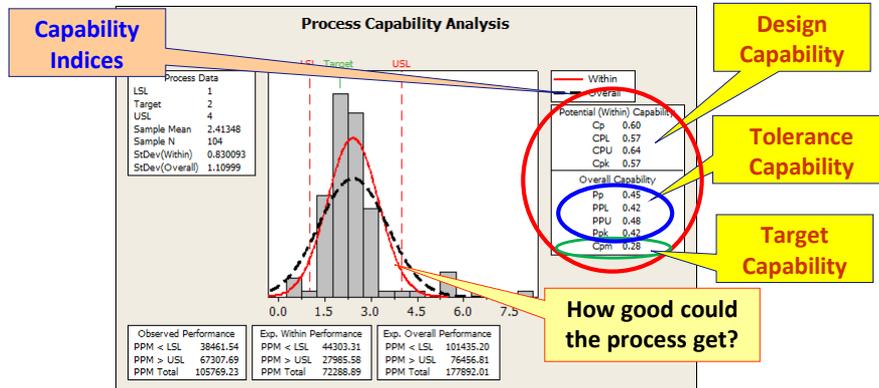
$$C_{pk} = \text{Minimum: } \frac{USL - \bar{X}}{3\sigma_{ST}} \text{ or } \frac{\bar{X} - LSL}{3\sigma_{ST}}$$



Variation reference is specification limit.

Process capability indicates the potential gains:

- Cp = Design capability index = Theoretical best results.
- Cpk = Achieved process capability = Actual results (within sub-group).
- Pp = Tolerance compliance capability = Theoretical best results.
- Ppk = Tolerance compliance capability = Actual results (across sub-groups).
- Cpm = Target compliance capability = Actual results for target compliance.



What prevents the process from operating at the “tighter” process capability?

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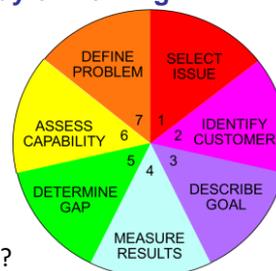
Develop an improvement team charter to define task:

Problem: a gap between our desired or target state and our current state.

What has changed in your process its standard way of working?

Interrogate the process!

- What changed?
- When did it change?
- What else changed at that time?
- Why did it change?
- How much did it cost?
- How does it affect our customers?
- How does it affect our productivity?



A project charter signifies management’s support of the team effort.

A project charter is a management document that has three distinct uses.

- It formally authorizes the initiation of a project.
- It records and communicates preliminary information about a project’s objectives and team composition.
- It completely defines a project at the close of the DMA phase. As time progresses a project the charter becomes more detailed as it records results and conclusions about the problem or issue.

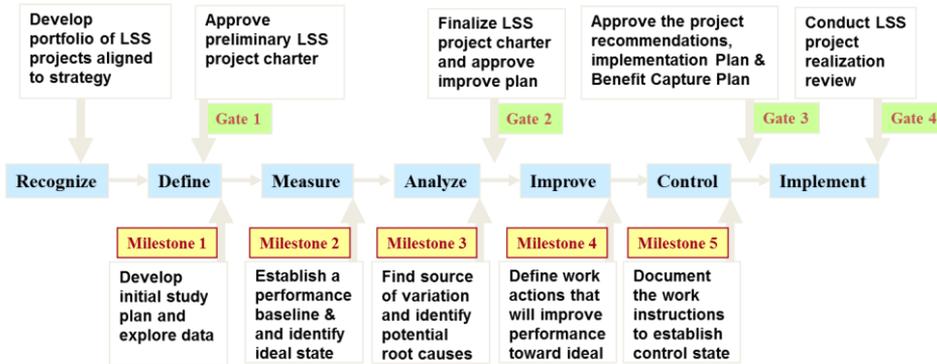
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Project initiation and review process:

Mentoring Job of the Management Steering Committee



Coaching Job of the Project Champion and Master Black Belt

LSS projects are **NOT** additional efforts – they are a means to achieve planned strategic business improvements.



MANAGING IMPROVEMENT PROJECTS

Management must choose rationally what to improve!

"All improvement happens one project at a time and in no other way."

~ Joseph M. Juran

Business self-assessment is a proven method for gaining insight:

- When improvement projects are initiated at the level of working processes then there is a good chance that these projects will not accumulate into an intentional strategic change, except by remote chance. Likewise, when all change management projects are initiated by management, then there is a strong likelihood that critical improvements to operational processes will not occur in a timely manner. Improvement projects must be initiated from both directions in order to assure efficiency in organizational process management.
- Management change projects should focus on core business processes or cross-functional processes which have no "natural" process owner in the functional management team. Work process improvement may require a strategic assist whenever the problem requires technical competence or a resource capability that is beyond the scope of the natural process owner.

Lean Six Sigma defines one part of POM:



Recognize → Define-Measure-Analyze-Improve-Control

At the front-end of the Process of Management (POM) are the need to establish the content of the strategy (as defined by single vision, strategic direction and strategic imperative) and supported by a self-assessment process, strategic benchmarking process within context of an integrated planning, execution and review process. Business excellence does not occur by accident, it is planned and executed with diligence. This defines the "recognize" front-end to LSS change projects.

So, what is Lean Six Sigma?

- **A philosophy of management** – the flawless execution in performance of the customer’s experience as compared to their expectation for results by taking out waste, removing defects, and increasing reliability of work efforts.
- **An analysis methodology that applies the scientific method** – Lean Six Sigma performs rapid, team-based problem-solving that focuses on getting the most out of current processes to optimize return on investment for the money that is already invested in current process capability while reducing working capital committed to business operations. It combines the approaches of the Toyota Production System and Six Sigma statistical problem-solving methods.
- **A process measurement methodology** – Sigma is a statistical quality measure of performance; the number of standard deviations between average level of performance and the customer’s requirement for performance. It is a market-oriented measure of “flawless execution” of work processes and outcomes.
- **A disciplined work culture** – people routinely manage with data and create an intolerance for variation and waste that affects their customers.

What is the “method of scientific inquiry”?

- Feel a difficulty based on explanation of experience
 - Doubt what has been taken for granted
 - Define the question
 - Form an explanatory hypothesis
 - Infer possible consequences
 - Define an experiment to test the hypothesis
 - Make observations using reproducible method
 - Analyze and interpret the data
 - Draw conclusions
 - Discover counter-instances
 - Revise and broaden the hypothesis
 - Apply the revised hypothesis to observations
 - Publish results of the investigation
 - Retest to validate or confirm the findings
- These steps are iterative.

Decision-making processes in LSS Improvement:

Lean Six Sigma (LSS) organizes the principles, methods and tools of quality so that teams can work on three systematic processes:

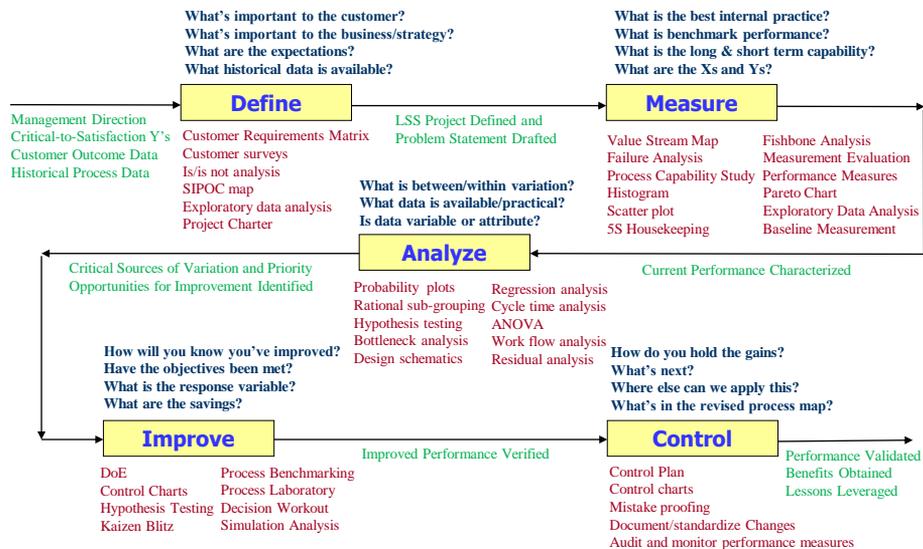
DMAIC – Statistical Problem-Solving – increasing capability in current processes

- **Define** – what performance improvement is required?
- **Measure** – how well are we doing today?
- **Analyze** – what contributes most to our degradation?
- **Improve** – what can we do to get better?
- **Control** – how can we maintain excellent performance?

DMADV – Design for Six Sigma – creating new outcomes with higher capability

- **Define** – what is the business issue that we are facing?
- **Measure** – what alternatives do we have to consider?
- **Analyze** – what does our customer need from us the most?
- **Design** – what is the best way to deliver this requirement?
- **Verify** – can we assure continuing, reliable performance?

BEST Lean Six Sigma™ DMAIC:



BEST Lean Six Sigma™ Ten-S:



10-S Method

Whose responsibility is it to accomplish each step in this lean process management approach?

- **Study** – Analyze work to find waste and value losses
- **Sort** – Divide work into categories according to value
- **Systematize** – Organize the flow of the work activity
- **Sanitize** – Clean the work place to make waste visible
- **Streamline** – Eliminate unnecessary activities
- **Simulate** – Check work performance prior to change
- **Synchronize** – Set the timing for optimal work flow
- **Safeguard** – Eliminate the possibility of mistakes
- **Standardize** – Assure all work follows the standard
- **Self-Discipline** – Consistently perform and improve

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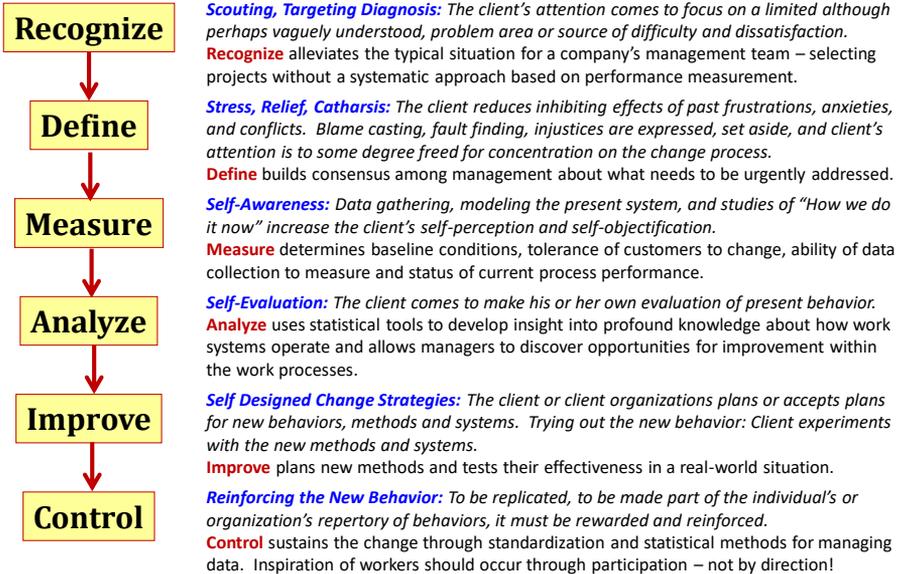
Is it time for a new model that integrates these ideas?

Generic Approach	DMAIC	DMADV
Explore / Characterize / Plan-Do	Define	Define
	Measure	Measure
	Analyze	Analyze
Learn / Optimize / Check-Act	Improve	Design
	Control	Verify
Change / Implement	Integrate / Standardize	Produce

- What would be the features of a simplifying model that is able to integrate the components of DMAIC and DMADV into one way of working at “continual improvement” whether it be for a process, service or product?

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William T. Morris – Change Implementation:



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What must management improve?



Improvement projects in these areas must be “chartered” by the appropriate management authority:

- Management is obligated to improve the “common causes” of process variation – sources of variation that are built into the process by physical design or by policy and procedures which are set and required by management.
- Management is also obligated to improve performance in any “special cause” of process variation where it has not properly provided workers with the capacity to change: (1) providing a clearly defined performance goals and means to measure its progress; (2) training in the methodologies required; and (3) a delegation of decision rights to self-regulate performance.

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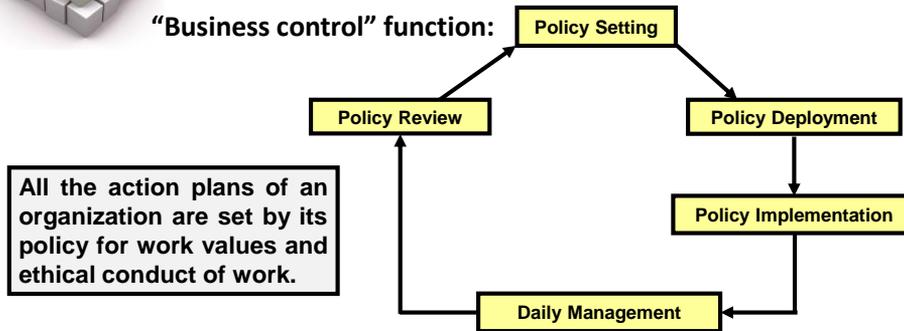
Managing the management system:



What does it take to put a management system in order?

How does “Hoshin Kanri” provide a steering function for the strategic management of a firm?

“Business control” function:



All the action plans of an organization are set by its policy for work values and ethical conduct of work.

Policy Management: The process of setting policy, implementing policy in business processes and work procedures and reviewing work activities to recognize (find and address) innovative business improvement opportunities.

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How does policy deployment work?

In “Policy Deployment” what is the policy?

- System for aligning everyone to work toward same organizational ends.
- Direction must make sense and employees motivated to participate!
- Policy development requires engagement of the entire organization.
- Purpose of policy is improvement (quality, cost, time, breakthrough).
- Policy performance targets are for an enterprise not a single person.
- Performance targets must be analyzed for the system not set arbitrarily.
- How should management engage the workers in defining policy?
- How should management engage the workers in reviewing progress?

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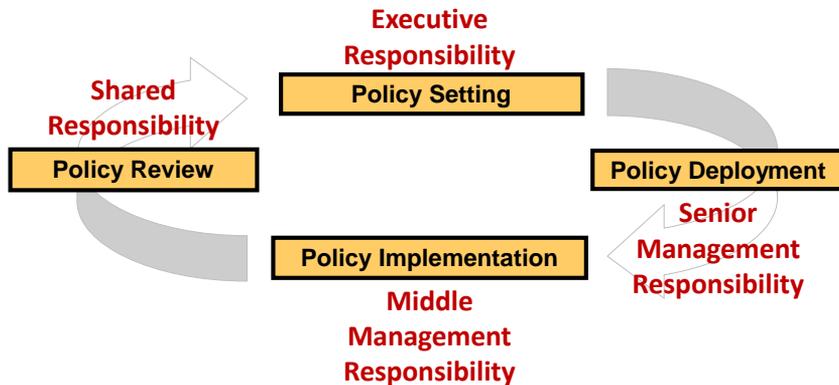
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Cycles of review drive project initiation and execution:

What is the relationship between “Hoshin Kanri” projects and the top management’s change agenda?

- Alignment and integration of strategic change projects occurs through a series of negotiated project initiation discussions across the levels of the organization (catchball) with all of the participants agreeing to the final set of improvement projects.



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DMAIC is practiced “one project at a time!”

- Improvement projects are the engine of change in the Lean Six Sigma methodology. There are four types of projects:
 - **Problem-Solving** – focused on finding and implementing corrective and preventive actions to work process problems.
 - **Lean Improvement** – focused on reducing waste and cycle time by using statistical indicators to focus an organization’s priorities for enhancing the value they deliver to customers.
 - **DMAIC Projects** – focused on improving both the efficiency and effectiveness of work processes by attacking ‘the long tail’ in statistical distributions to make the work processes perform more consistently and at higher levels of capability.
 - **Design Projects** – focused on addressing innovative change when current work processes do not have the inherent ability to be improved to the level of performance capability that is required in the future (capability of current process design is not high enough to meet the required performance level).

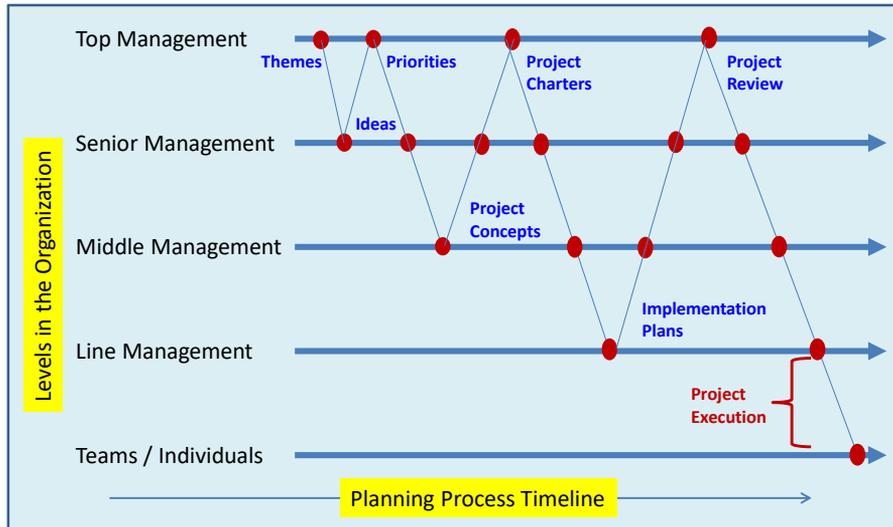
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Illustration of the “catchball process” for initiation:

Managing the “initiation” of a process improvement project:



All change is made to influence performance of the daily management system (routine work).

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How are improvement projects conducted?



- Projects are selected by management from proposed opportunities for improvement
- Initial charter issued to the project team for further refinement
- Projects tracked and reviewed by the responsible manager
- Teams are guided by specially trained facilitator
- Structured analysis method tailored for specific problem or issue
- Solutions tested and evaluated prior to implementation
- Solutions documented and integrated into work
- Lessons learned leveraged across the organization
- Final report documents learning, accomplishments and future work

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Developing an implementation plan

Information Recorded:

- Date: Report Date (version control)
- Owner: Individual Responsible for Plan
- Period: Planning Period Covered
- Page: Pagination of Report
- Improvement Focus Area: Specify Topic
- Current State: Summarize current state of performance for the focus area topic
- Goal: General outcome to be achieved (to address planning horizon of 1-5 years)
- Objective: Measurable achievement toward accomplishment of goal (1-year)
- Status: Summary of progress toward goal.

Actions:

- Action (Owner): specific action planned to achieve objective within planning horizon (individual responsible identified as owner)
- Performance Measure/Target: Measure and targeted level of achievement to be obtained
- Status/Date: Performance level achieved

Date:	Owner:	Period:	Page: 1/1
Improvement Focus Area:			
Current State:			
Goal:	Objective:	Status:	
ACTIONS			
No.	Action (Owner)	Performance Measure/Target	Status Date:
1			
2			
3			
4			
5			

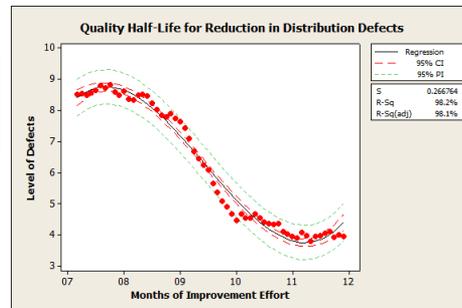
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Quality half-life improvement measurement: Continual improvement can be consistently managed:

Quality half-life function from dedicated improvement of work to move toward a local 'optimal' condition. *



- Continued effort at quality improvement follows a logarithmic curve for reduction in defect levels until the process reaches a point of performance equilibrium which indicates attainment of its natural process capability. Further improvement requires that design changes be made to the process to increase its inherent or ideal state of performance capability.

* Actual performance reported by a participating "Skunk Camp" company in Finland!

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How to make a dedicated plan to improve?



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

~ Joseph M. Juran

- Management at all levels must be dedicated to stop wasting the money it invests in the business.
- Lean enterprise management begins when over-investment is eliminated; investments are used effectively; people are also used effectively and are the “brains” to drive improvement at all levels and in all areas of the business; and concern for the customer is placed as a paramount value throughout the full process from design of products and production processes to the delivery of the “experience” to the end customer.
- All improvement happens one project at a time: choose these projects carefully for maximum system-wide benefit.

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ASSURING RESPONSIBILITY FOR QUALITY

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Principles of personal quality at Toyota:



Distinction: Mistake → Error → Defect

- Workers are responsible for the quality of their work.
- Workers share responsibility for throughput of the process.
- Workers are responsible for improving the quality of work.
- Workers are granted decision rights to stop production.
- Workers are trained in their process, provided tools to do the job right, and given achievable, measurable goals to accomplish.
- Workers are encouraged to participate in improvement of their machine operations as well as routine maintenance and cross-training of co-workers.
- Workers are encouraged to experiment (under supervision of a coach) with improvements that will decrease cost and defects, improve cycle time or enhance safety.
- **By doing these things, Toyota has accomplished what it must to assure that employees can be held accountable for the quality of their work.**

“There is nothing more important than planting trees of will.” ~ Shigeo Shingo

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Everyone is responsible for the quality of the work:



- Job of the **worker**: assure quality of the work, maintain rate of production, make continual improvement in work process
- Job of **maintenance**: assure production availability, anticipate machinery and equipment problems, assure worker safety
- Job of **process engineer**: design production line flow, assure balance in the work, make continual process improvement, incorporate new technology
- Job of **supervisor**: assure standard work, train the workers, facilitate problem-solving and improvement efforts
- Job of **production manager**: encourage the workers, assure customers are delivered value, maintain relationships with suppliers, manage finances

“In Japan, it is said that “time is the shadow of motion.” In most cases, delay is generated by differences in operator motion and sequence. The job of the supervisor is to train workers. At the same time workers must be taught to help each other. Carrying out standard work methods in the cycle time helps worker harmony grow.”

~ Taiichi Ohno

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What is management's responsibility for quality?

Manager:

A person who controls an organization's financial, physical and human resources, risk, technology, and schedules to accomplish its purpose.

Management Responsibility:

Activity delegated from an accountable authority to be executed or accomplished as a task or project in an organization (e.g., from Board of Directors to CEO); focus areas for managerial accountability are: performance-to-schedule, customer satisfaction, legal and regulatory compliance, financial austerity and performance, information integrity, ethical and social guidelines, and mitigation of business and technical risk. This is now required through evolving global corporate governance standards.

What does it take to hold a manager accountable for quality?

- Clearly defined business objectives and performance targets are mutually agreed.
- Unambiguous delegation of decision rights, resources and expenditure authority.
- Ability to self-regulate management of their tasks using managerial best practices to deliver "desired outcomes."

Delivering valuable outcomes at maximized profit, minimum risk.

What is engineering responsibility?

Engineer:

A person who designs, develops and implements useful features and functions at the lowest total cost (including the costs of acquisition, waste and failure).

Engineering Responsibility:

A fundamental requirement of a profession is that the individual takes full personal responsibility for the quality of their work. This means that engineers are responsible to design product functions properly (right quality) and inform their organization of any risks or consequences that may arise from doing things wrong. This responsibility has been emphasized in all professional engineering codes of ethics!

What does it take to hold an engineer accountable for quality?

- Clear engineering design requirements.
- Training in methodology with competence developed.
- Ability to self-regulate the management of their design using engineering best practices to deliver an "engineered product."

Delivering useful functionality at minimal risk and cost.

Management responsibility for quality:

Essential elements of responsibility for management:

- Establish a quality policy
- Define objectives for quality improvement
- Construct a quality management system to deliver these objectives
- Ensure that people charged with quality management are competent
- Provide sufficient resources to achieve the objectives
- Communicate quality direction to the organization
- Management review should evaluate the need for change to all aspects of the quality management system
- Identify those individuals who act as management representatives and are responsible for:
 - Ensuring the processes needed to implement the quality system are defined, implemented and maintained.
 - Reporting on performance of the quality system and its improvement
 - Promoting awareness of customer requirements throughout the organization

Specific management requirements in ISO9000:

- Management is to establish the quality policy and quality objectives. The management review must be used to evaluate the need for changes to the quality management system, quality policy and quality objectives.
- The quality policy must be communicated and understood at "appropriate" levels, rather than at "all levels," within the organization.
- Top management has the responsibility and must provide evidence of their commitment to ensure the availability of resources.
- It is now possible to have more than one designated management representative.
- The organization must ensure that personnel with defined responsibilities in the quality management system are competent based on appropriate levels of education, training, skills and experience.
- The organization must provide resources and facilities that are specific to the product.
- Top management must provide evidence of their commitment to the development and improvement of the system, which includes communicating to the organization the importance of meeting customer, regulatory and legal requirements.
- Top management must ensure that the quality policy shows a commitment to continual improvement, provides a framework for quality objectives and is reviewed for ongoing suitability.
- The quality objectives must be established at relevant functions and levels, be measurable and consistent with the quality policy, and include those objectives needed to meet product requirements.
- Top management must ensure that customer needs and expectations are determined and fulfilled.
- The organization must define and communicate the responsibilities and authorities necessary to facilitate effective quality management, as well as communicating the effectiveness of the quality management system and processes.
- The management representative has the authority and responsibility to promote the awareness of customer requirements throughout the organization.
- The inputs to the management review must be explicit and must include audit results, feedback from customers, process performance and product conformance analysis, preventive and corrective actions status, follow-up actions from previous management reviews, and any changes that might affect the quality management system.
- The outputs from the management review include actions relating to improvement of the quality management system (and its processes), product improvement (related to customer requirements) and resource needs.
- In a timely manner, the organization must determine and provide the necessary resources to implement and improve the quality management system processes and address customer satisfaction.
- The organization facilitates continual improvement through the use of the quality policy, objectives, audit results, data analysis, corrective and preventive actions, and management review.
- The organization must establish and document a quality policy, quality objectives and its commitment to quality.
- The quality policy must be relevant to organizational goals and customer requirements.
- The quality policy must be disseminated throughout the organization.
- Responsibilities and authorities are to be defined and communicated.
- Top management is responsible for allocating adequate resources relating to the quality management system.
- The management representative must be a member of top management who has defined responsibility and authority on matters relating to the quality system.
- Top management is responsible for the periodic quality system review to ensure its suitability and effectiveness.
- Records of management reviews must be kept.

Systems for Quality Development:

SUMMARY:

- The QMS should be operated as a key part of strategic management that delivers differentiating performance in business and operational processes. Operational performance indicators must be linked to the financial indicators to assure control over cost drivers is maintained.
- The process of continual improvement include components of self-assessment; development of a portfolio of opportunities that may later become designated improvement projects; standardized ways to map and measure processes, analyze risk and solve problems;
- Quality systems should be designed for robust control as well as for rapid resolution of statistical out-of-control (OOC) conditions. Should the system reach the point of out-of-specification (OOS) operations, then the Corrective Action/Preventive Action (CAPA) process must be initiated to prevent problems from reaching the customer; fix the immediate cause of the problem and develop a permanent solution.

Parting observation:

Managing for Quality ...

“You don’t have to do this, survival is not compulsory!”

~ W. Edwards Deming

Thank you! Any questions?

BUSINESS EXCELLENCE SOLUTIONS

