

Understanding the Financial Components of Quality



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How will “Managing for Quality” change?

- Session 1 Making Quality-Based Executive Decisions
- Session 2 Leading Transformation – Managing Improvement
- Session 3 Designing Quality as an Inclusive Business System
- Session 4 Conducting Executive Inquiry and Formulating Strategy
- Session 5 Understanding Japanese-Style Strategy Management
- Session 6 Organizational Learning – Triple-Loop Experience
- Session 7 Engineering Management – Designing Future Firms
- Session 8 Understanding the Financial Component of Quality**
- Session 9 Reflecting on Strategic Implications of Attractive Quality
- Session 10 Discovering Profound Insights of Operational Excellence
- Session 11 Defining Quality to Apply to Everyone, Everywhere
- Session 12 Managing for Quality Amidst Digital Turbulence

Abstract of Session #6:

Quality professionals typically discuss financial implications of quality as first defined by Armand V. Feigenbaum and called Cost of Poor Quality (COPQ) by Philip B. Crosby. This concept is not persuasive to executives, senior managers, or their CFOs. Management applies traditional cost accounting methods using standard cost to plan and make their resource investment decisions and analysis of payback and benefits.

This webinar provides quality professionals with better insights into related subjects of economics, accounting, and finance to understand how they apply to business. It also describes inherent conflicts that have existed since the 1800s between labor-based and capitalist-based theories for understanding sources of profit and allocating the benefits according to contributions of both labor and investors. This is a complicated structure that entails economics, finance, and accounting. To understand it, this webinar links the historical roots of economics with its evolution into modern accounting which occurred from 1880 to 1939. Critical implications that this evolution has on accounting for waste and loss in productive operations will also be discussed.

This insight helps quality managers improve conversations on financial matters as they discuss benefits of quality improvement with C-Suite team that relies on the traditional accounting method of standard costing to allocate costs are allocated, define benefits, and track performance for quality improvement activities.

Learning Objectives for Session #6:

Learning Objective 1: Understand how costs has been treated from an historical perspective – what is the evolution in its development?

Describe the historical evolution of economic theory and cost accounting practices.

Learning Objective 2: Learn how quality has been accounted for in these historical evolutions of financial decision-making?

Identify the source of distortions in financial methods that have an impact on decision making and how quality accounting is conducted.

Learning Objective 3: Discover the difference between the conditions of “over-quality” and “under-quality!”

Investigate the meanings of “over-quality” and “under-quality” as based on the historical use of quality-cost trade-off curves that have been used since the mid-1950s and discover how the mental model creates much confusion about the value of quality among business leaders.

Setting the stage for this discussion:

Understanding the three aspects of monetary methods:

- **What is the job of accounting?**

Accounting counts the money that comes in (as sales) and also counts money that goes out (as expenses). What remains left is gross profit.

- **What is the job of finance?**

Finance decides where to get investment funds, how to manage the money received, and then what arrangements to make for its return or payback.

- **What is the job of economics?**

Economics defines the monetary system of society and governs financial linkages between companies and national the systems for wealth distribution and allocation of social benefits.

Understanding the Financial Components of Quality

Part 1:

Historical Development of Financial Methods

Economics has been called “the dismal science!”

“Microeconomics concerns things that the economists are specifically wrong about, and macroeconomics concerns things economists are wrong about generally.”

“Or, to be more technical, microeconomics is about the money you don’t have, and macroeconomics is about the money that governments are out of!”

**~ Patrick, J. O’Rourke
Political Comedian**

The “roots” of economic thinking:

How did our thinking evolve to the current state of economics?

- Economics is the study of how available resources are used and organized to deal with the needs of society.
- **Discussions leading to the rise of mercantilism and trade:**
The earliest form of economics described how trade occurred between states and gave rise to the mercantile class.
- **Eventually this evolved into “classical” economics:**
Classical economic theory refers to wealth as the ebb and flow of money and is about how value is assigned to trade. It holds three principles: each pursues what is best for themselves (or self-interest), division of labor (specialization of work), and the freedom of production and trade (trade is mutually beneficial) to assure that the best interests of society are fulfilled.

Applications of economic analysis:

How did our thinking evolve to the current state of economics?

- **Aristotle, St. Thomas Aquinas, and Albertus Magnus:**
Natural law implies utilitarian theory, competition, and rules to establish prices as an interdependence between beliefs (or metaphysics) and economics set the basis for free markets.
- **Adam Smith and *The Wealth of Nations*:**
Identified the morality of wealth and established the current concept of the “free market” which operated through action of “the invisible hand” responding to supply and demand to set prices. It is best managed by “laissez faire” or “hands-off” way by government not-interference through policy decisions.
- **Discussions about production in the “Industrial Revolution:”**
Mass production change the balance of power in business.

How is the field of economics divided?

How did our thinking evolve to the current state of economics?

- **Macroeconomics – the study of wealth in society:**

How do employment, wages, and prices influence growth of the entire social system of a nation? It studies the balance of trade between nations, productivity of a nation, and relative contributions of industries to Gross National Product (GNP). It deals with the aggregate performance of a national economy.

- **Microeconomics – the study of resources within a firm:**

What decisions do individuals and companies make about the distribution of resources and the price of goods and services? This focuses on supply, demand and forces that define how to establish prices to manage product demand. It deals with the local economic condition of a firm within its industry.



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Microeconomics makes a firm competitive; macroeconomics describes how well a firm's industry operates in society.

Economics describes the flow of money accounting counts where it is going!



Accounting for Accounting:

- Accounting is the measurement, processing and communication of financial information about an economic entity.
- Accounting speaks “the language of business” and is used to “keep score” of the results that are obtained by management.
- Accounting provides a systematic recording, reporting and analysis of the financial transactions of an organization.
- Accounting involves the summarization of bookkeeping results as well as the analysis, verification and reporting of the results.

How did modern accounting evolve?

The initial focus was on paying workers and making them efficient.

- **Emile O. Garcke** (1856-1930) and **John Manger-Fells** (1858-1925) wrote the first text on cost accounting. It applied cost records to double entry bookkeeping and separated between fixed from variable costs [***Factory Accounts: Their Principles and Practice*** (1887)].
- **Frederick W. Taylor** (1856-1915) emphasized used cost information to evaluate work processes efficiency and sought “The One Best Way” to design work and exploit productivity [***Piece Rate System*** (1895), ***Shop Management*** (1903) and ***Principles of Scientific Management*** (1911)].
- **Harrington Emerson** (1853-1931) said that the primary purpose of cost accounting is to aid in reducing costs through disclosing the existence of inefficiencies in the operations of a firm [***Efficiency as a Basis for Operations and Wages*** (1909) and ***The Twelve Principles of Efficiency*** (1912)]. He used costing methods to track efficiency improvement.

How did modern accounting evolve?

The initial focus was on paying workers and making them efficient.

- **Alexander H. Church** (1866-1936) developed a systems of accounting principles based on scientific management to assure the production of parts efficiently and the profitability of the firm using a documented, structured accounting system [*Proper Distribution of Expense Burden* (1908), *Production Factors in Cost Accounting & Works Management* (1910), and *The Science and Practice of Management* (1914)].
- **Henry L. Gantt** (1861-1919) invented a chart to assign responsibility and measure performance rather just maintain accounting cost control over expenditures [*Organizing for Work* (1919)].
- **G. Charter Harrison** (1881-1958) developed the equations to calculate standard cost and the accounting procedures to apply them [*Cost Accounting to Aid Production: A Practical Study of Scientific Cost Accounting* (1921)].*

Basic elements of standard cost accounting have now been developed!



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* Paul T. Crossman (1958), "The Nature of Management Accounting," *The Accounting Review*, 33:2, pp. 222-227.

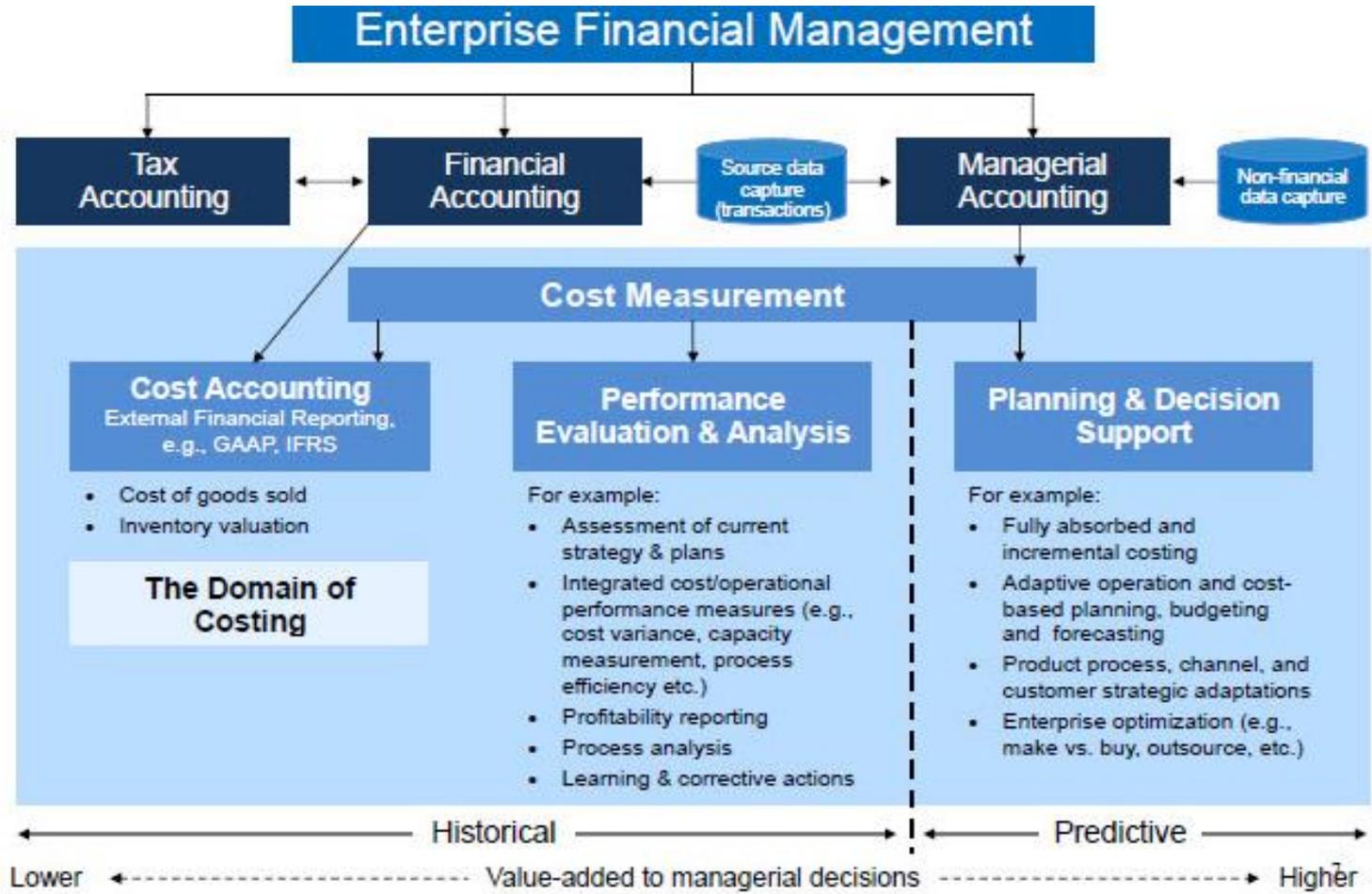
How did modern accounting evolve?

Next modern accounting analysis methods were developed:

- **James O. McKinsey** (1880-1937) invented an ability to analyze finances and provide senior managers with decision making support beyond the efficiency-producing techniques of engineers [*Budgetary Control* (1922) and *Managerial Accounting* (1924)].
- **F. Donaldson Brown** (1885-1965) created ratio analysis methods for the analysis of financial efficiencies (i.e., Return on Investment (ROI), Return on Equity (ROE), etc.) to analyze budgets. This was called the du Pont method after General Motors CEO Pierre S. du Pont (1870-1954).
- **Walter A. Shewhart** (1891-1967) concentrated on production efficiency for economic control of quality by emphasizing control of the processes of production using statistical methods to produce predictable results at the lowest cost (including the cost of failure) [*The Economic Control of Quality of Manufactured Product* (1931)].

The current state of accounting is still the same!

Accounting has not changed in principle since then; just in number of rules!



Key definitions of terms used in accounting:

- **Managerial Accounting:** a process of identifying, measuring, analyzing, interpreting and communicating information about finance and cost to make informed decisions for enhancing business control.
- **Fixed Cost:** a cost which does not change with respect to the volume of goods or services that are produced.
- **Variable Cost:** costs of material, labor, and overhead that will change as a function of goods or services produced.
- **Standard Cost:** an estimate of the cost of operations for the production of good or services using average historical data.
- **Overhead:** a cost or expense (e.g., rent, utilities, etc.) related to activity of the organization rather than attributed to a specific operation.
- **Absorption:** assignment of fixed and variable costs to calculate product or service cost (used for assigning general cost to estimate price).
- **Ratio Analysis:** a method for converting all financial data into a set of simple mathematical ratios for comparison (e.g., ROI, ROA, ROC, etc.).

Why is the CFO so important to executives?



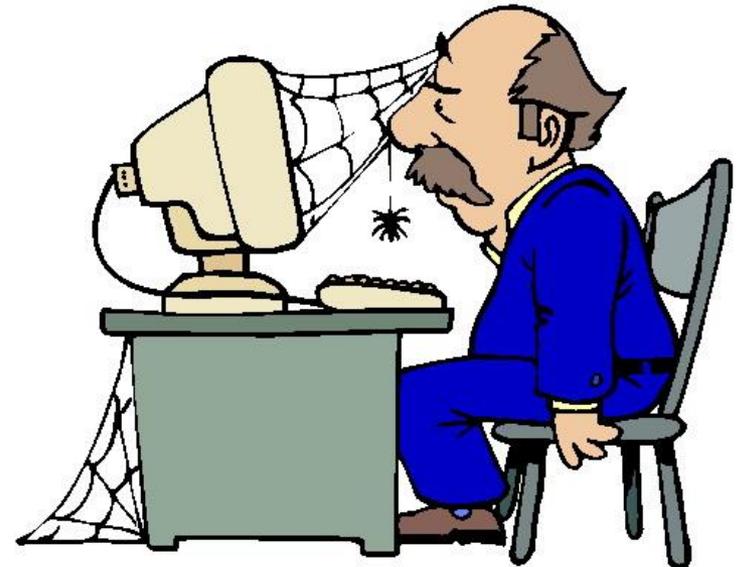
- CFOs provide the performance reports to its governance body about performance with respect to funds invested into their organization and their ability to produce benefits that meet investor expectations for profitable growth.
- Accounting systems were developed to report profit and loss and calculate taxes. Accounting systems have two functions:
 - (1) Managing and controlling financial transactions to meet legal and ownership requirements; and
 - (2) Aiding management to make better decisions about actions that will deliver future financial benefits.

Understanding how financial analysis works:

Demythologizing the top tier of financial operating reports:

- Executives manage “bottom-line” profitability by cutting costs.
- Executives manage “top-line” growth by increasing sales.
- Managing organization finances requires learning this language and its accompanying logical system for reporting.
- Organizational efficiency (e.g., cost control) is modeled using a cash flow of its income and expenses.
- It is essential to learn how changes in these flows will influence the an organization’s profitability.
- An example of these changes will help.

How to interpret business system of accounts?



Understanding how financial analysis works:

Demythologizing the top tier of financial operating reports:

Impact of a 10% sales price increase:

| | | | | |
|---------------------|--------------|---|--------------|------------|
| Sales | \$100 | → | \$110 | 10% |
| Cost of Good Sold | <u>75</u> | | <u>75</u> | |
| Gross Margin | \$ 25 | | \$ 35 | |
| Selling, R&D, Admin | <u>14</u> | | <u>14</u> | |
| Operating Profit | <u>\$ 11</u> | → | <u>\$ 21</u> | <u>91%</u> |

A 10% Price Increase Results in a 91% Profit Increase!

Understanding how financial analysis works:

Demythologizing the top tier of financial operating reports:

Impact of a 10% reduction in Cost of Goods Sold (COGS):

| | | | | |
|-------------------------|---------------------|---|----------------------|--------------|
| Sales | \$100 | | \$100 | |
| Cost of Goods Sold | <u>75</u> |  | <u>67.5</u> | - 10% |
| Gross Margin | \$ 25 | | \$32.5 | |
| Selling, R&D, Admin | <u>14</u> |  | <u>14</u> | |
| Operating Profit | <u>\$ 11</u> | | <u>\$18.5</u> | + 68% |

A 10% Reduction in CGS Results in a 68% Profit Increase!

Understanding how financial analysis works:

Demythologizing the top tier of financial operating reports:

Impact of a 10% reduction in sales and general administrative expenses (SG&A):

| | | | | |
|-------------------------|---------------------|---|-----------------------|---------------------|
| Sales | \$100 | | \$100 | |
| Cost of Goods Sold | <u>75</u> | | <u>75</u> | |
| Gross Margin | \$ 25 | | \$ 25 | |
| Selling, R&D, Admin | <u>14</u> |  | <u>12.6</u> | <u>- 10%</u> |
| Operating Profit | <u>\$ 11</u> |  | <u>\$ 12.4</u> | + <u>13%</u> |

A 10% Reduction in SG&A Results in a 13% Profit Increase!

Understanding how financial analysis works:

Demythologizing the top tier of financial operating reports:

Home Run: Improving EVERYTHING by 10%:

| | | | | |
|----------------------------|---------------------|---|-----------------------|-----------------|
| Sales (UP) | \$100 | ➔ | \$110 | + 10% |
| Cost of Goods Sold (DOWN) | <u>75</u> | ➔ | <u>67.5</u> | - 10% |
| Gross Margin | \$ 25 | | \$ 42.5 | |
| Selling, R&D, Admin (DOWN) | <u>14</u> | ➔ | <u>12.6</u> | - 10% |
| Operating Profit | <u>\$ 11</u> | | <u>\$ 29.9</u> | ➔ + 272% |

10% improvement in each item results in a 272% profit increase!

In the words of some executives:

“I often find that at times that our accounting methods either work against our improvement activities or mislead our focus.”

“It is only a 1% problem, so we can ignore it as it will cost more to correct that in the process than we pay in warranty costs.”

“We don’t have to worry about the bad parts coming from our suppliers, we can just charge them back for this as a restitution for a poor contract performance.”

“It doesn’t matter if we are either a little above or behind cost estimates – it all averages out in the end.”

Financial implications of executive decisions:

Traditional Decision Criteria: Act quickly; show fast financial returns and benefits, and easy for management to rapidly implement.

| | | Speed of Implementation | | |
|-------------------------|----------------|---|---|---|
| | | Fast (1 year or less) | Medium (2-3 years) | Slow (over 3 years) |
| Difficulty to Implement | Easier | <ul style="list-style-type: none"> • Start a sales campaign • Change pricing • Discontinue products or services offered • Change incentives • Reduce budgets • Replace management • Downsize organization • Close facilities • Squeeze suppliers on pricing or discounts • Increase/reduce debt | <ul style="list-style-type: none"> • Consolidate operations • Divest business unit • Buy-back shares • Merge companies • Acquire business • Consolidate suppliers • Outsource functions • Extend patent term • Change accounting methods or periods • Extend the current product families | <ul style="list-style-type: none"> • Develop new core competence and/or process capabilities • Digitize data collection • Influence the content of applicable third-party standards • Lobby to assure more favorable laws and tax regulations • Develop brand image and reputation |
| | More Difficult | <ul style="list-style-type: none"> • Divest FGI inventory, assets, or resources • Automate production • Inventory liquidation • Modify old products or services | <ul style="list-style-type: none"> • Relocate to reduce tax or reduce regulations • Change IT Systems • Develop new products • Execute an inversion (shift corporate HQ) | <ul style="list-style-type: none"> • Develop new markets • Introduce advanced technology • Change work culture • Design an innovative business model |

Quarterly financial reports drive all decisions to the near term for ease of implementation.

Scientific perspective to studying quality:

“Do not seek to follow in the footsteps of the old masters, seek instead what these masters sought.”

~ Matsu Basho (1644-1694)

So, what were the masters seeking? Delivery of productivity that would provide the maximum in economic benefit.

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Part 2:

The Financial Treatment of Quality

Connecting quality to the economy:

How does quality relate to economics, accounting and finance?

Macroeconomics

**Provide
for Needs**

**Distribute
Wealth**

Tax and Monetary Policy

Gross Domestic Product per Capita

Microeconomics

**Increase
Sales**

**Reduce
Costs**

Capital Investments

Productivity & Profitability

**Quality
of Life**

Counting for the cost of poor quality: Rejects, Scrap and Rework

Weaknesses in standard cost accounting:

Management cannot get clear about what it should improve!

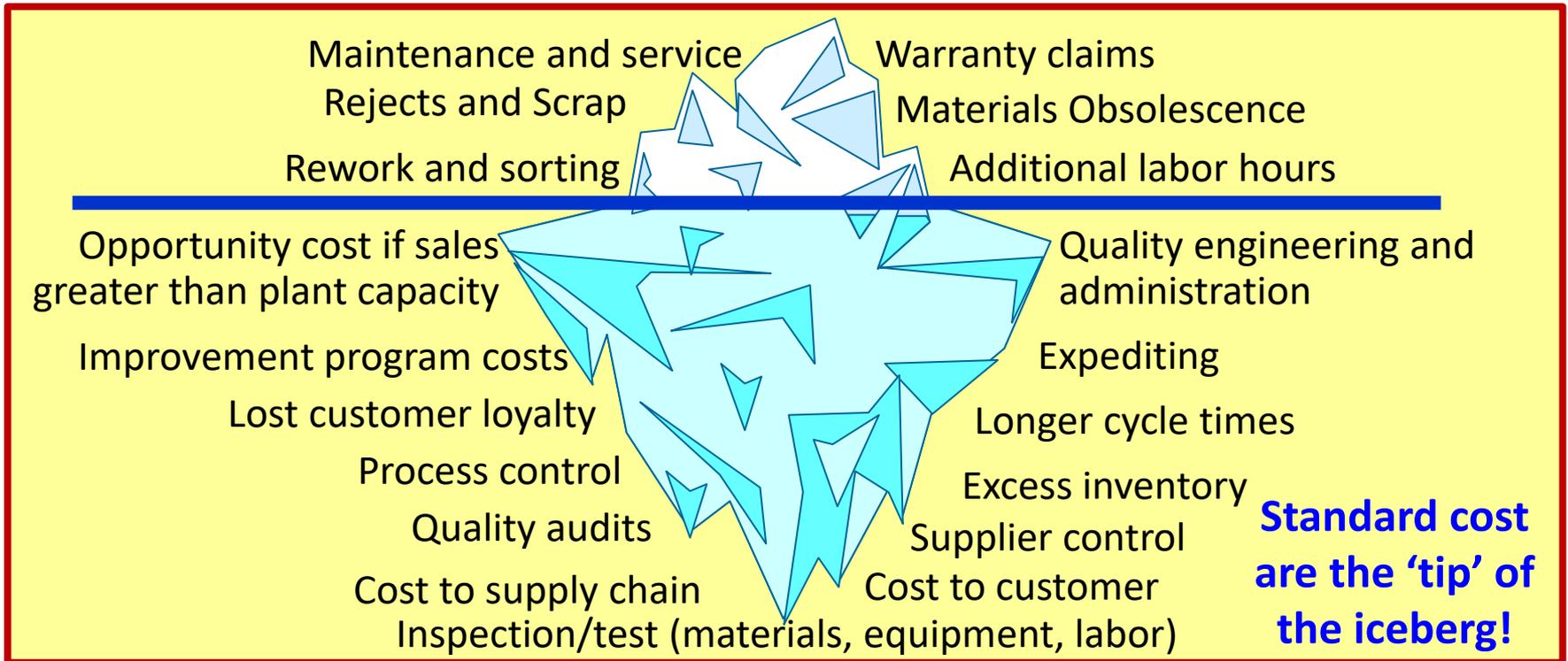
- Standard cost accounting measures the cost of 'doing' and not the cost of 'not doing' according to Peter F. Drucker. It accounts for the correction of failure commissions and not for the cost of failure omissions!
- Standard cost accounting does not account for 'opportunity cost' or the benefits that foregone when decisions are made to pursue one specific commitment of resources, rather than another. Opportunity cost is benefit that could have been derived if a resource decision was made differently.
- Standard cost accounting assigns costs to specific cost centers; however, when costs are easily assignable or it is not possible to link bookkeeping records to the fixed cost structure, then costs are assigned using ad hoc informal rules to balance the books – this process is allocation.
- These conditions distort management's picture about possible decisions it can make to improve the financial performance of the organization.



Easy to count what you see ...

... but it is difficult to count what you don't!

“Not everything that is counted counts, and not everything that counts is counted.”
~ Albert Einstein



What are quality costs?

These calculations suffer from basic bookkeeping problems!

All direct and indirect costs related to poor quality are not captured by standard cost accounting methods and often are allocated to areas or processes which do not create the failure conditions that drive the cost.

COQ = Failure Cost + Appraisal Cost + Prevention Cost

Failure Costs:

Strategy is minimizing!

- Cost that is directly associated with problems (things gone wrong or hassles to customers, e.g., defects, delinquencies, delays, etc.) whether or not they are incurred internally or externally by customers or society.
- Examples include: Failure recovery, corrective action, warranty returns, after sales service (unscheduled service), engineering change-order (redesign, tooling, obsolescence, and change-over expenses), public relations for brand recovery), help desk, and reject, scrap, and rework.



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Visible failure costs are easy to detect, but it is difficult to understand a full causal chain.

Include the costs of planned quality actions:

Appraisal Costs: Strategy is minimizing!

- Costs incurred to determine conformance to quality requirements
- Examples include: Receiving inspection and test, production or on-line compliance tests, off-line inspection laboratory, prototype costs, experimental expense (e.g., either simulation or statistically Designed Experiment), cost of status monitoring and reporting cost, customer survey cost, and management reviews of both business stewardship and exception conditions.

Prevention Costs: Strategy is controlling!

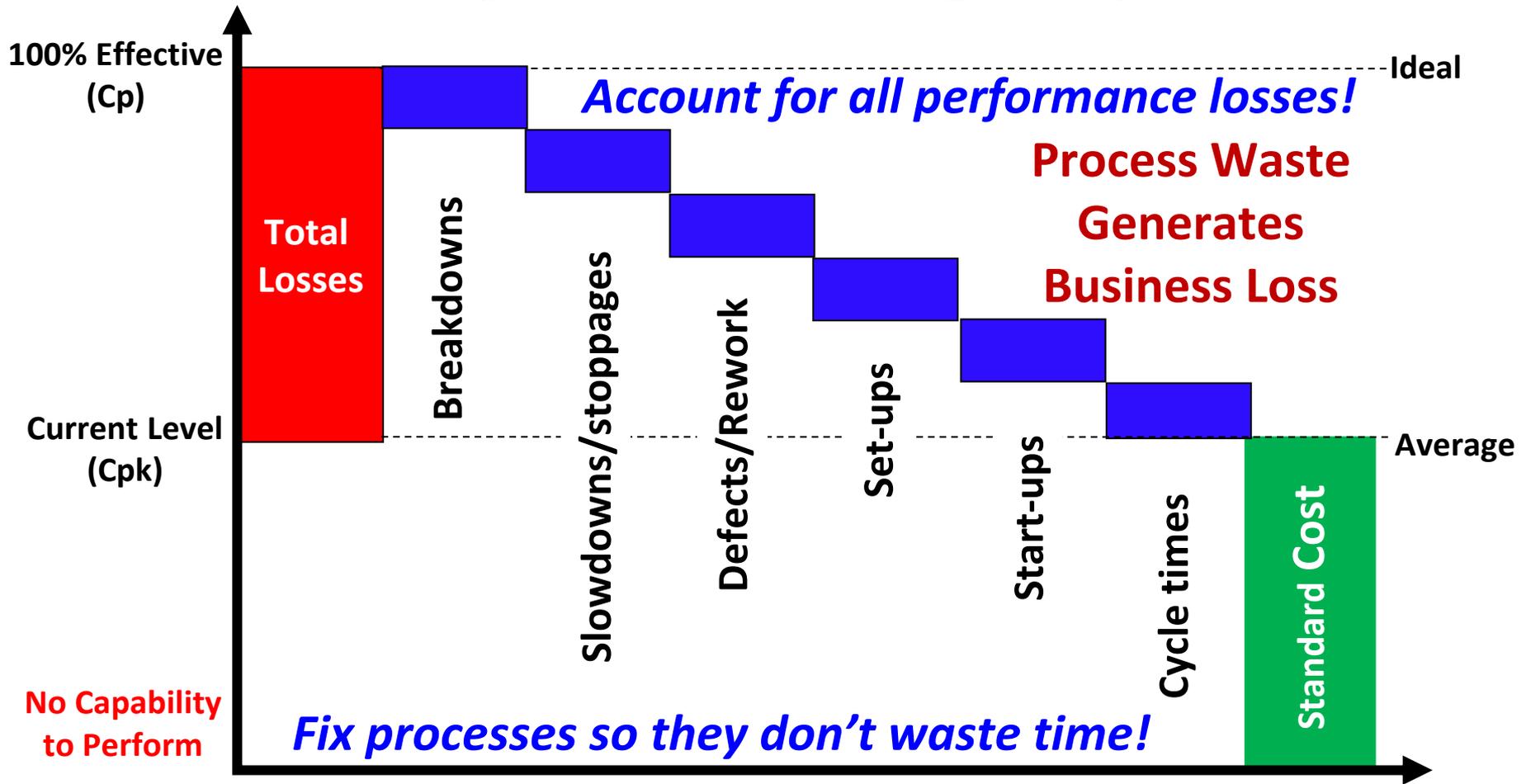
- Costs incurred to reduce appraisal and failure costs and assure robust performance capability.
- Examples include: Product initial qualification, design reviews, supplier evaluations and audits, operator training, quality audits, preventive maintenance, ISO9000 implementation costs, quality improvement project costs.



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Only prevention costs are worthy for annual investments!

Understanding the internal quality losses:



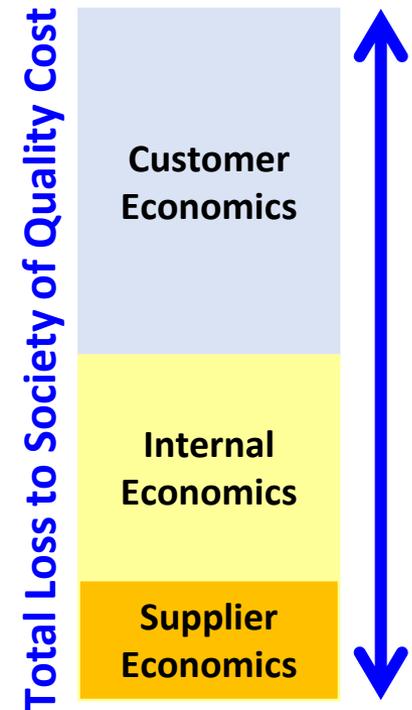
Also consider contribution of external cost!

Evaluate financial dynamics and loss from a systems perspective:

- Waste must be eliminated from both internal and external costs.
- These wastes include losses produced by design of inefficient production systems; excessive levels of inventory at all stages of value (raw, work-in-progress, and finished goods); production cycle time beyond necessary time; as well as inefficient distribution systems.
- Challenges to improve performance must be part of all supply chain management improvement projects and built into contractual obligations for value engineering of these activities.

Jeffrey H. Deyer (2000), *Collaborative Advantage: Winning through Extended Enterprise Supplier Networks* (London: Oxford University Press).

Often the external costs associated with poor quality are greater than the internal costs!



The value contribution needs to be evaluated from a point of view of the full value chain.

Quality cost catches management attention!

What is the best reason to do a one-time survey of quality cost?



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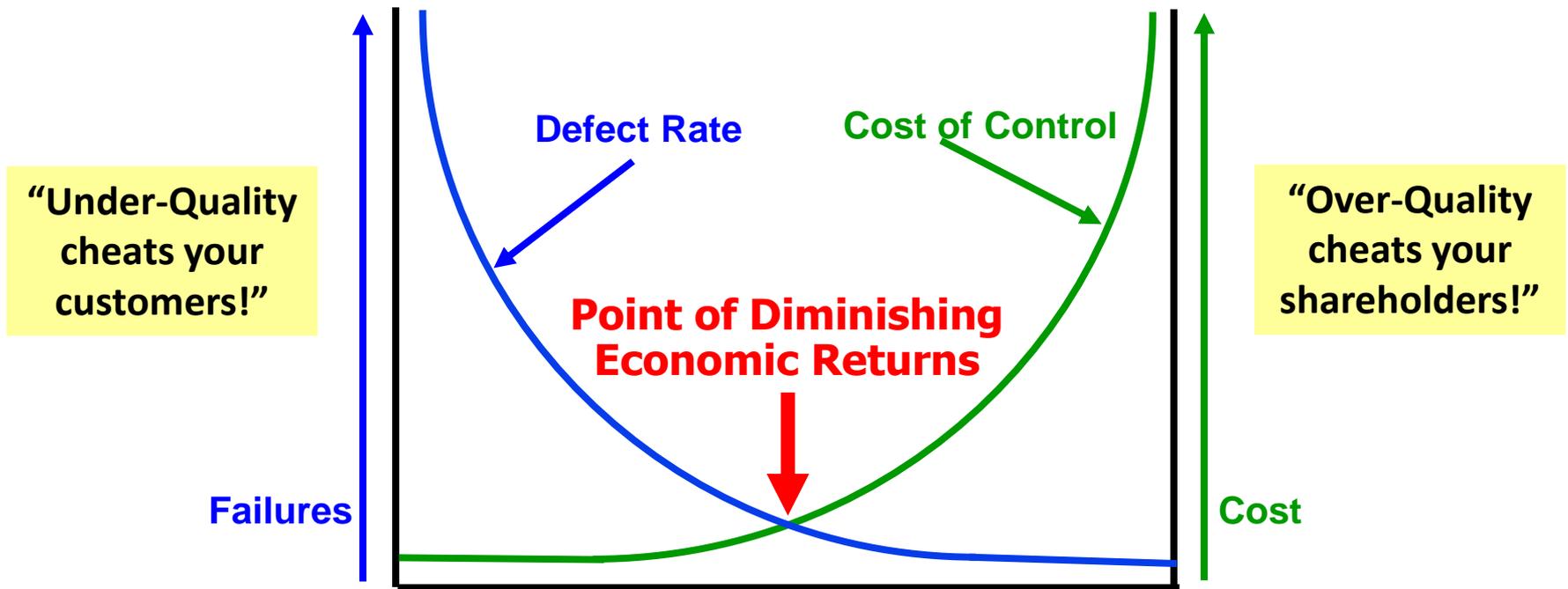
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It can be a real eye-opener!

Financial Decisions About Quality: Under-quality vs. Over-quality

Is there a trade-off between cost and quality?

Have you ever seen this mental model of a proposed trade-off?



The conclusion from this model is that you can have “too much” quality for the cost that has been invested!

How this model actually operates ...

How were these “functions” calculated?

The model originated in the mid-1950's when quality control occurred through inspection. Elimination of defects occurs by the relative efficiency of inspectors to find and sort out defective types of products from those that had acceptable quality.

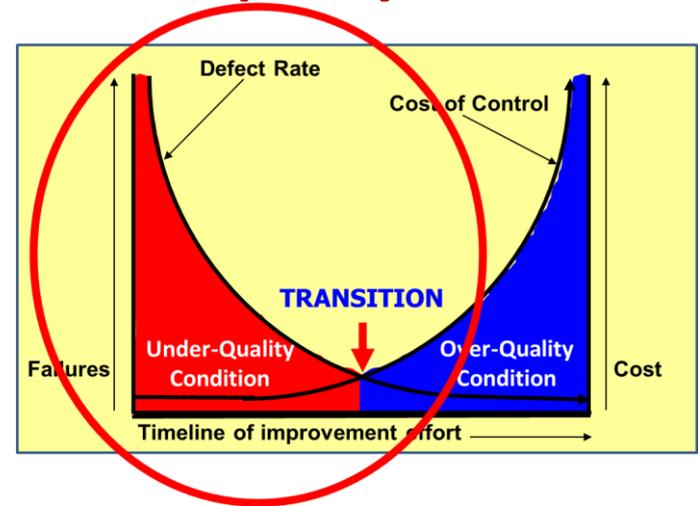
- **Defect Rate:** The rate of defect reduction that is achieved by the act of adding additional inspectors to check the same flow of outgoing products for defects and reduce them by sorting.
- **Cost of Control:** The additional budget that must be added in order to pay for the salaries and expenses of inspectors that are added to reduce the outgoing flow of defective products.

However, this is a very expensive solution and does not result in a permanent change to the quality performance of a process!

Interpreting the “under-quality” conditions:

Under-quality occurs if investments in products or services do not deliver the specified or expected level of quality as desired by customers.

- It is a natural state of performance.
- Loss occurs when defects or waste produce no value or if efficiency is lost in productive time.
- Under-quality also occurs if desired features do not deliver a level of its performance that is needed.



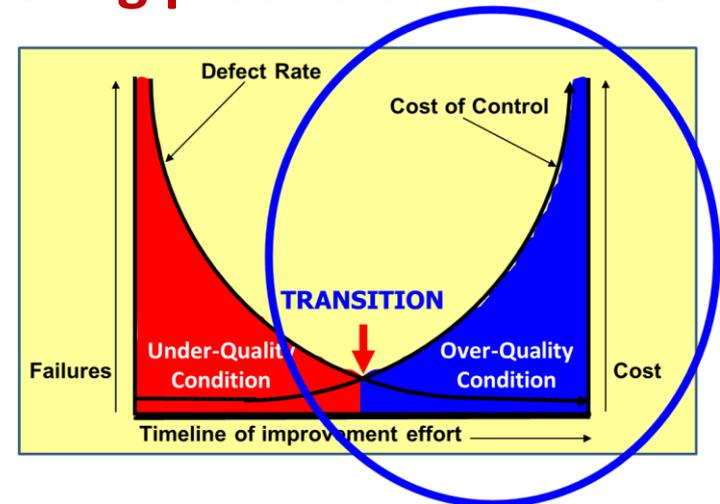
Customers loose!

Standard costs includes COPQ in its budget base. Thus, management plans to continue the loss as it is embedded in standard cost assumptions. This makes management blind to these “failure contribution to cost.” The financial penalty is not just loss in cost from waste it is also a psychological penalty to workers in terms of demotivation and the loss of employee pride in their work.

Interpreting the “over-quality” conditions:

Over-quality occurs if investments are made to deliver quality that customers do not want or in delivering products or services they will not buy!

- This quality state occurs if there is poor understanding of customer needs.
- One type of loss occurs if an undesired feature is included in a product.
- Another occurs if more is invested in a production system that is required (e.g., buying unneeded robots or unnecessary automation).

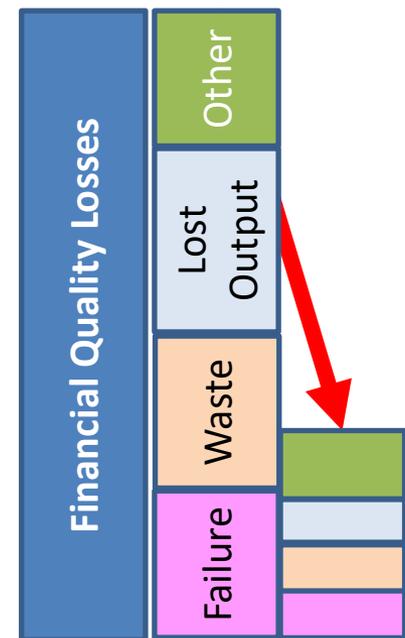
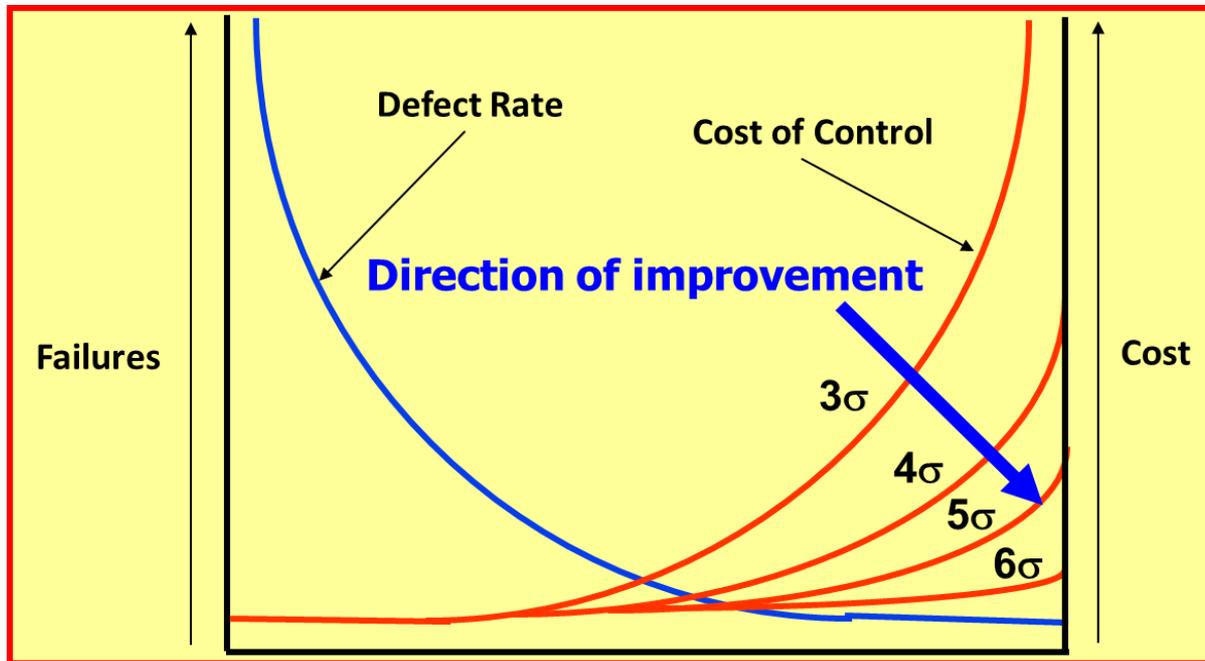


Shareholders loose!

The rule is don't pay more than is required and do not invest more than necessary. The degree of quality achieved is defined by choices made by management. If leadership understands and directs policy appropriately, then good results are more likely.

Understanding this dynamic properly:

What is actually adding cost if you improve work processes?

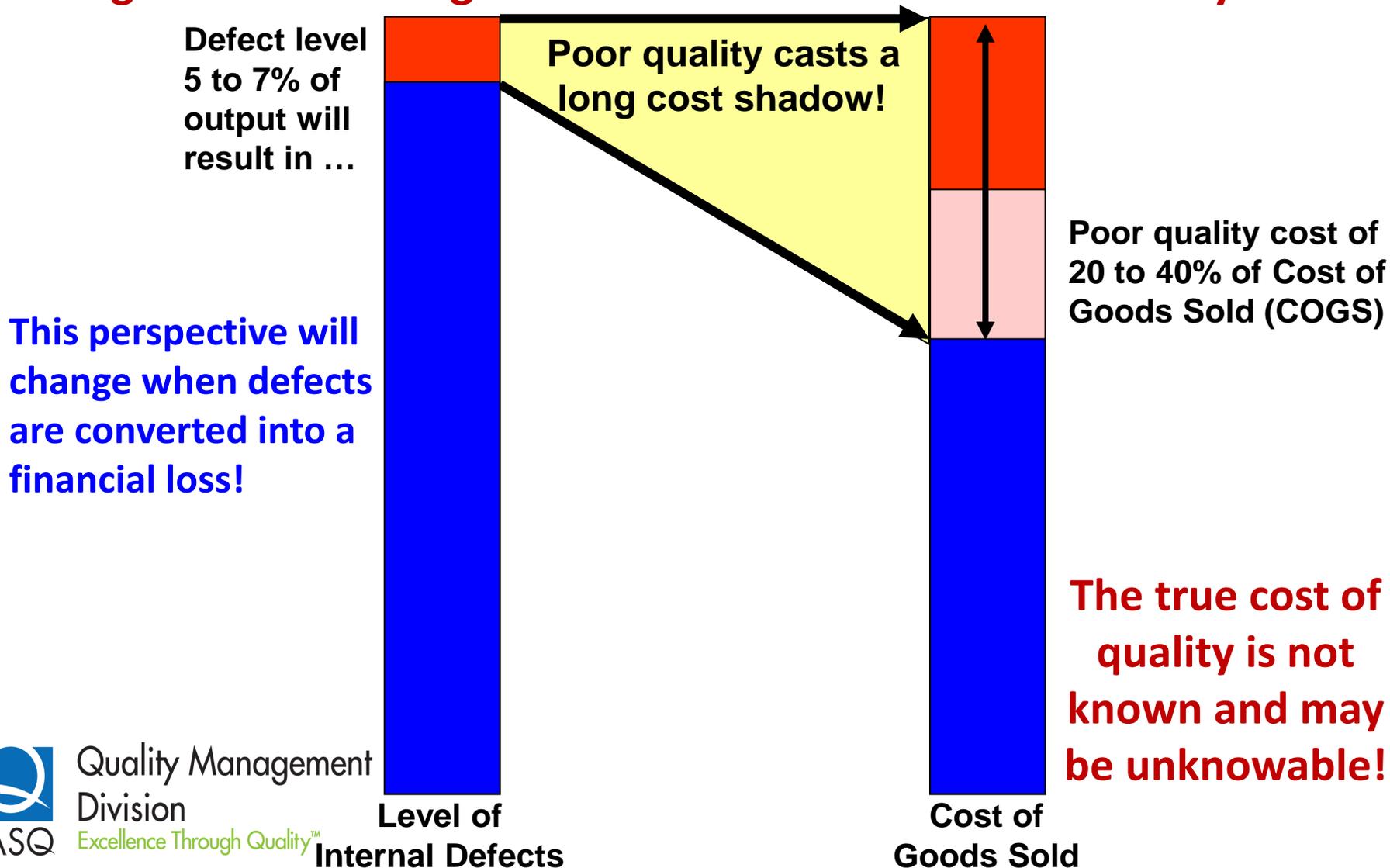


- Step 1 is to get the design right, according to the market strategy.
- Step 2 is to design and develop a cost-effective system of production.
- Step 3 is to operate the end-to-end productive system with efficiency.

Accounting for transaction costs by using a form of activity-based costing is the best way to see where costs are incurred and to eliminate those that are not necessary.

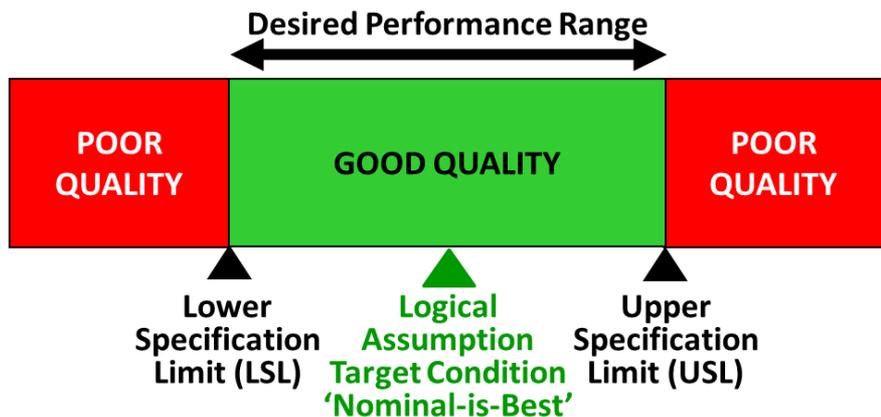
What happens when you change the scale?

A rough estimate using heuristic observation from over 25 years:



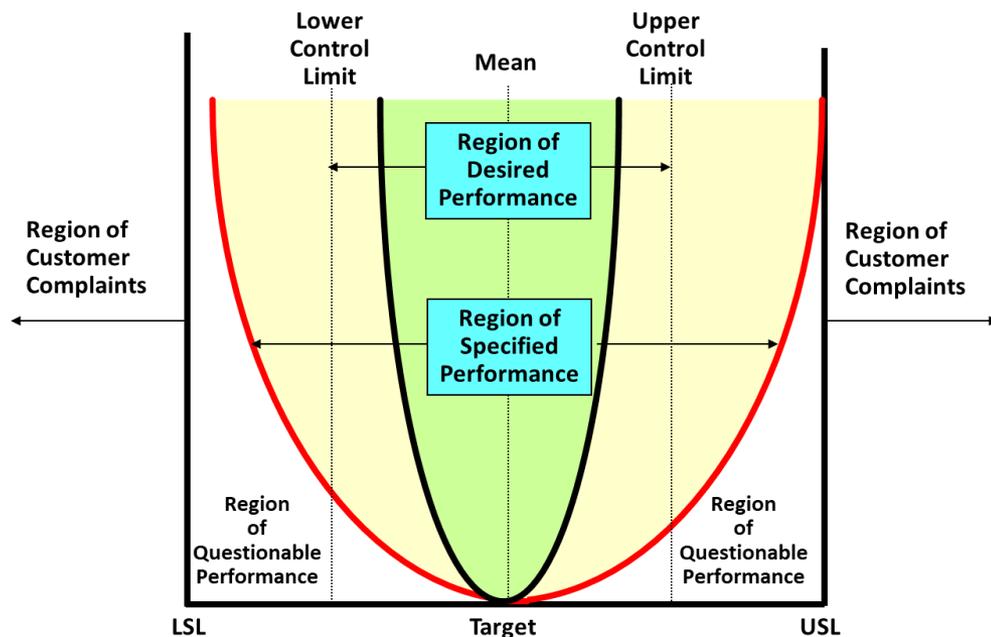
Taguchi Loss Function: Quality loss to society!

A “goal post” concept of quality requirements is no longer valid.



- Shewhart specified quality is within a band of acceptable statistical control, not achieving an “acceptable” quality level. Taguchi identified three rules to evaluate quality losses:
- Maximize: “bigger is better.”
- Minimize: “smaller is better.”
- Nominal Control: “nominal is best.”

- There is no magical number that specified results achieved beyond this point are good and if they do not, then they are bad.

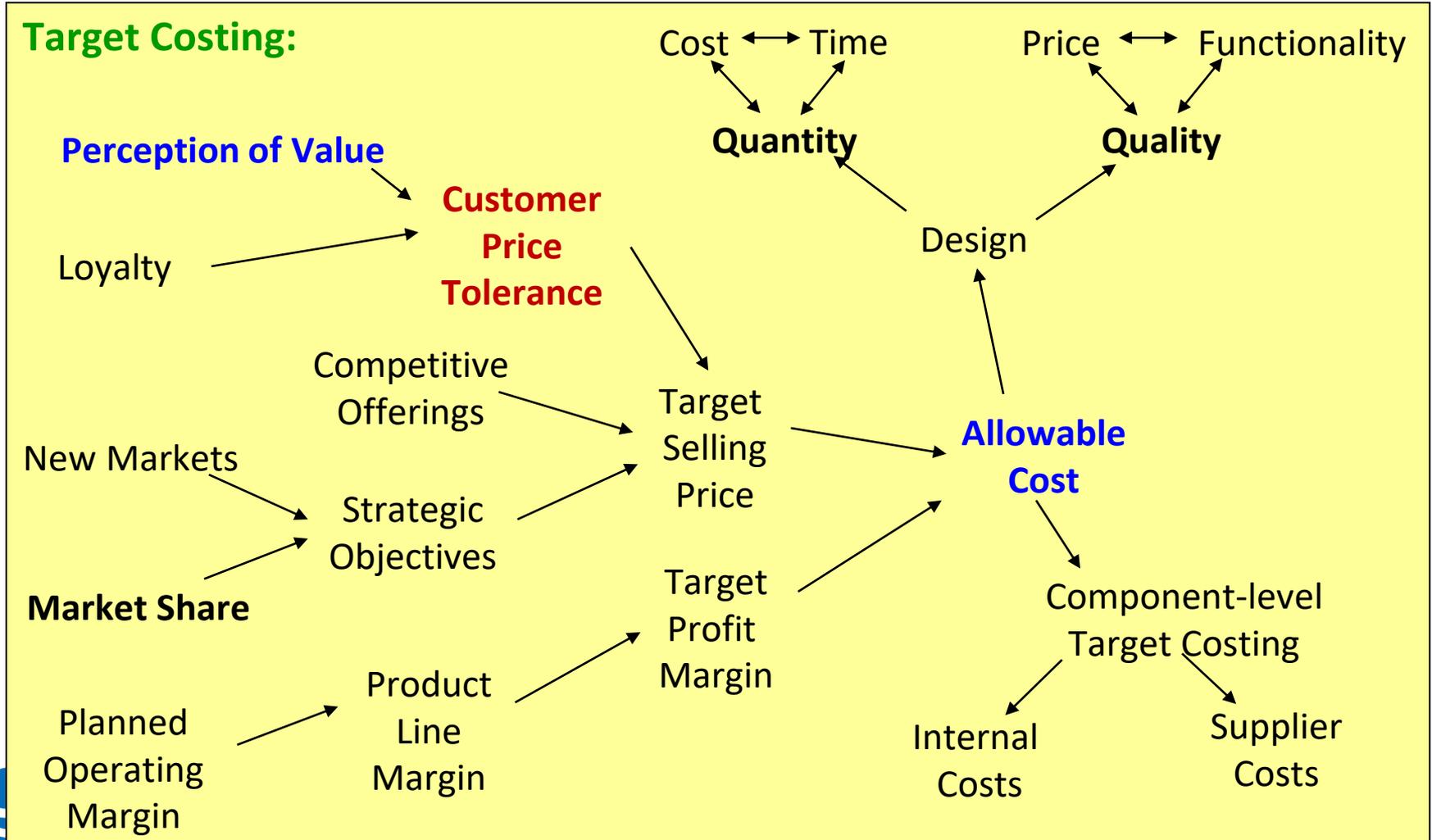


Quality should be designed so it minimizes the loss to society after production occurs.

Applying Financial Considerations to quality issues in New Product Development

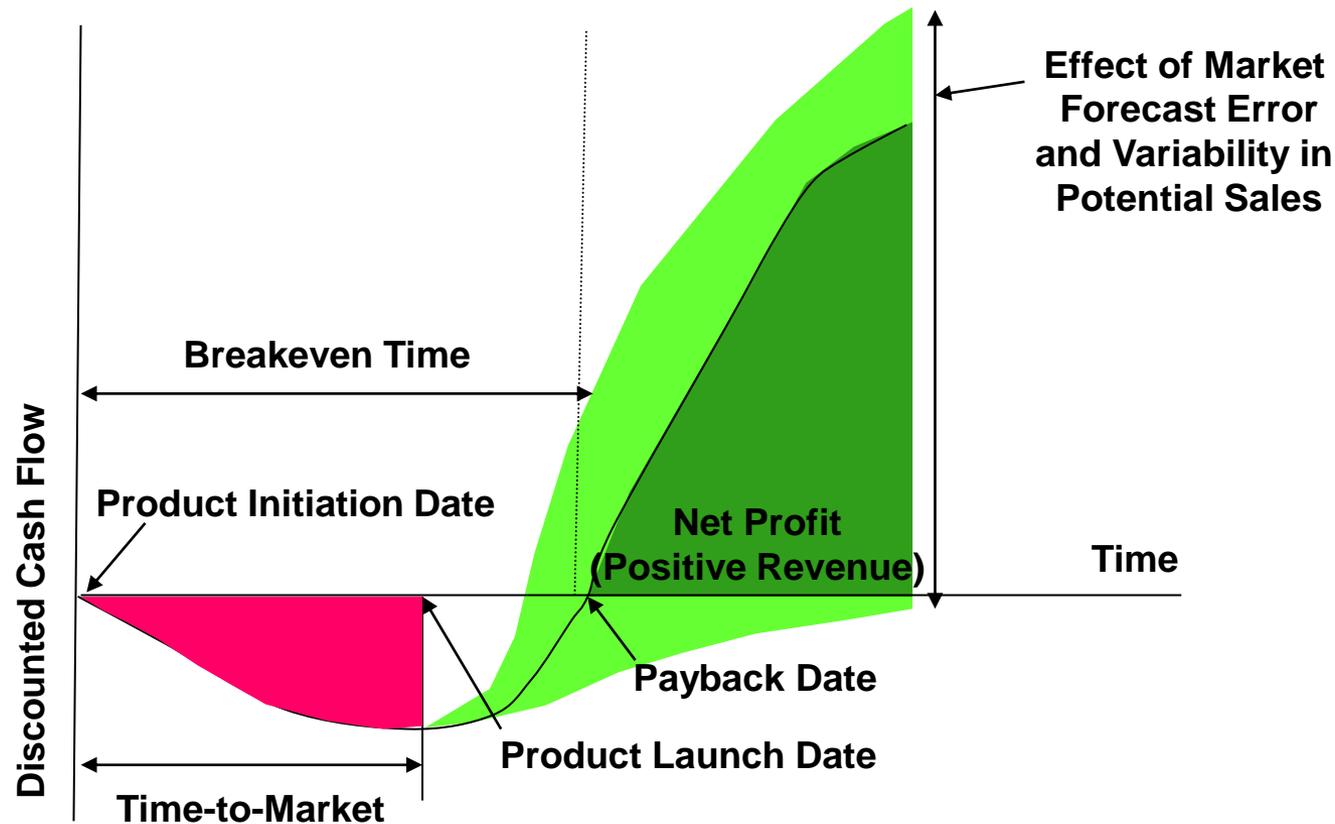
Designing products and parts to cost targets:

Approach applied within R&D in the Toyota Design System:



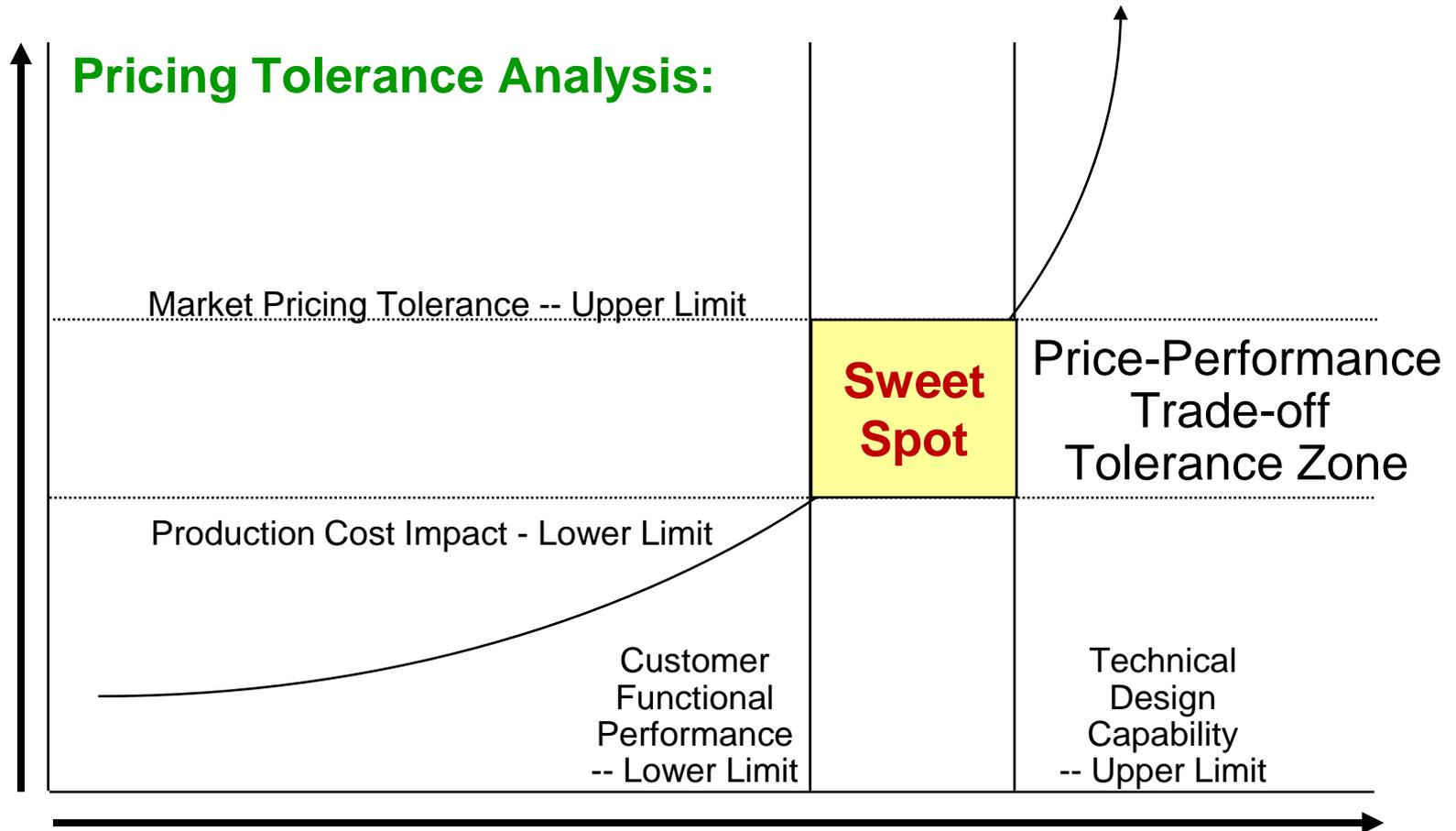
BET: Planning for “Breakeven Time”

Methodology developed by Hewlett-Packard in the late 1980s:



Price sensitivity study:

Understanding the viable domain for product pricing:



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Take-away Lessons Learned

Critical take-away observations:

Final lesson: manage costs at the source as they are incurred as lags, leaks, or friction that create the waste which lead to loss in work processes. Take care as you transfer from the operational scale of measurement to a financial scale: it is not honest, open, and transparent!

Summary statement

This webinar addressed the following learning objectives:

- Understand how costs have been treated historically.
- Learn how quality costs are treated in decision-making.
- Discover distinctions in “over-quality” and “under-quality”



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Thank you

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Future QMD Webinars – 6:00 PM ET

(unless noted otherwise)

[Managing for Quality Webinar Series by Dr Gregory H. Watson:](#)

No. 9: "Strategic Reflections on Kano's Attractive Quality" September 15, 2020

No. 10: "Insights into the Essence of Operational Excellence" September 29, 2020

No. 11: "Defining Quality to Apply to Everyone, Everywhere" October 14, 2020

No. 12: "Managing for Quality Amidst Digital Turbulence" November 17, 2020

Other Webinars in 2020:

"QMD Part 2- How to use MyASQ for sharing vital knowledge" by Doug Wood 8/27/2020 **2 pm ET**

"Managing Quality 4.0 combining ISO 25010 Criteria and ITIL practices" by Dan Zrymiak 9/14/2020 **5 pm ET**

"QMD Part 3- How to find QMD Content" by Susan Gorveatte 10/5/2020 **3 pm ET**

"Write Persuasively So Readers Understand Your Message" by Leslie O'Flahavan 10/8/2020

"QMD Part 4- How to create content in support of quality management professionals" by Dawn Ringrose
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