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## FEATURED ARTICLE

# Quality Cost 4.0 From Theory to Deployment



By John Cachat

*"This is the most comprehensive analysis of poor-quality cost as it relates to the 21st century business environment that has been prepared. Leasing it in with the advancements that are going on in knowledge management and artificial intelligence will provide a significant boost to an organization's performance as measured in the bottom line. Saving money in a process that doesn't reach the bottom line is just a wasted effort and should be discouraged. Into these fierce competitive environments, we must stay focused on the results."*

Dr. H. James Harrington

## Bottom Line Up Front

For decades, cost of quality theorists have been seeking an approach for a practical deployment of the quality costs process. "Quality 4.0" is a term that references the future of quality and organizational excellence within the context of Industry 4.0. Quality

*Continued on page 2*

professionals can play a vital role in leading their organizations to apply proven quality disciplines to new, digital, and disruptive technologies. Quality 4.0 provides the opportunity to make this happen across a variety of businesses.

The purpose of quality costs is to understand what something costs—the consumption of resources. Wasted resources include people, equipment, materials, and more that are not perceived as adding value to the customer.

The ASQ Quality Improvement Pocket Guide: Basic History, Concepts, Tools, and Relationships defines the cost of quality:

*“Cost of quality is a methodology that allows an organization to determine the extent to which its resources are used for activities that prevent poor quality, that appraise the quality of the organization’s products or services, and that result from internal and external failures. Having such information allows an organization to determine the potential savings to be gained by implementing process improvements.”<sup>1</sup>*

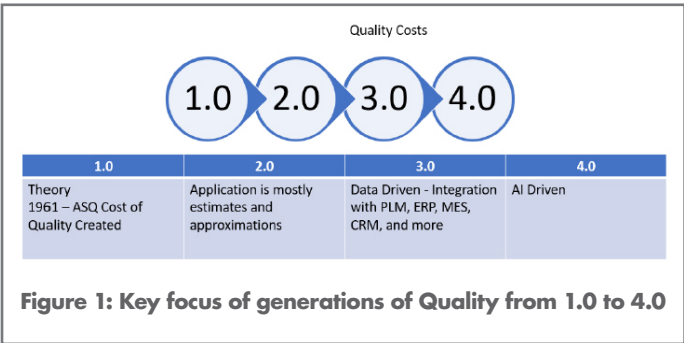
The Harrington Group International cost of Quality 4.0 definition is more like this:

*“Cost of Quality 4.0 is a “success planning” business process that provides information utility for better decision-making about the application of resources to drive corporate goals. The data is delivered promptly, in a usable format, and from a credible source. The approach looks at the alternatives and lessons learned regarding the distribution of prevention, appraisal, and failure activities. Having such real-time information allows an organization to make better decisions about the potential savings to be gained by implementing process improvements.”*

Quality costs can be defined as the difference between current operating costs and operating costs if there were no failures (manufacturing and front office).

Q4.0 provides a new outlook using data accumulators from data models across multiple sources. This paper provides the knowledge on how to design, build, deploy, and maintain a Q4.0 Quality Cost process. The solution lies in the development of a logical data model based on processes.

Implementing a Quality Cost 4.0 Information Utility Business Model is a complex task that needs a smart and all-encompassing strategy. Harrington’s Quality Cost Accumulator is a new 4.0 technology that makes quality costs deployment and review faster, easier, and more effective. The key focus on quality in each generation of Quality from 1.0 to 4.0 is shown in Figure 1.



The ROI from providing employees with real-time quality cost information includes:

- Failure cost reduction
- Improved decision making
- Risk mitigation
- Competitive advantage

The ongoing challenge is to make decisions about the right amount of prevention costs. This is not a simple tradeoff between quality and costs. Time, flexibility, capacity, and more are all variables and cannot be addressed in isolation.

If you let your imagination go wild, what would you do if you had the same statistics/analysis common in national sports teams with your organization? One more step; what if “gamification\*” could be included to accelerate adoption and promote continued use?

\* The application of typical elements of game playing (e.g., point scoring, competition with others, rules of play) to other areas of activity to encourage engagement. Quality costs can appear on the income

statement and balance sheet as product and period costs as shown in Figure 2.

## History of Quality Costs

After completing an extensive literature search from 1951 Juran, 1961 ASQ Quality Cost Committee, and up to today, there are common conclusions, including:

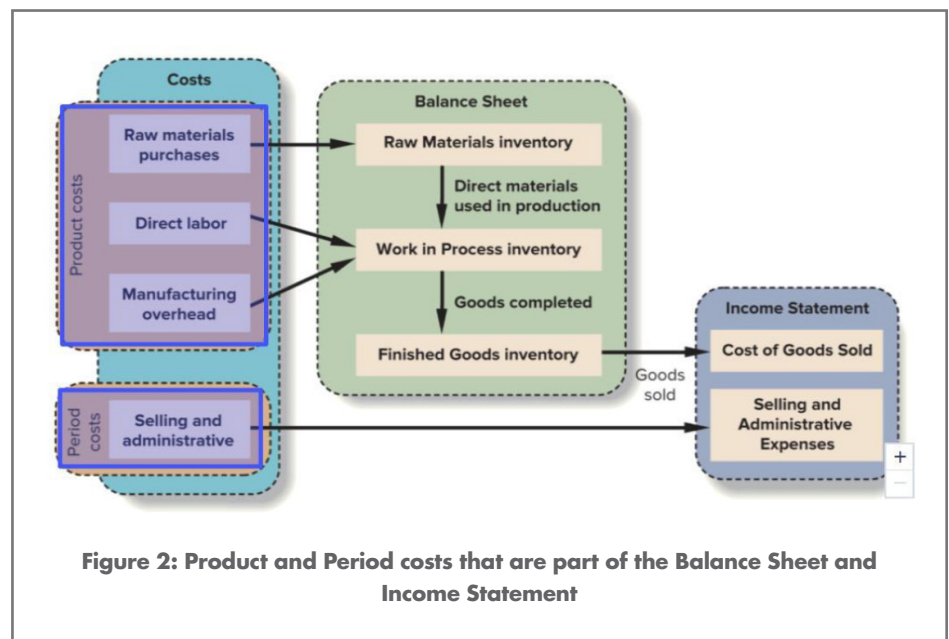
- Managers that have access to meaningful and understandable quality cost information make better decisions. The information needs to be presented in terms of money.
- Implementing a quality cost process that provides meaningful and understandable quality cost information in a systematic way is difficult to maintain.
- Accounting systems designed to generate external financial reports are not intended to provide quality cost information. Quality costs are absorbed into product cost overhead and camouflaged in traditional accounting systems.
- Companies using variance reports for decision making are far removed from the causal factors.
- The lack of management support is due to a lack of cause-and-effect relationship that shows the impact of corporate goals.
- An organization will remain in its current state if the forces for change are equal to the forces against

change. Creating motivation to change current behavior is always a challenge. "If it ain't broke, don't fix it" versus continuous improvement mentality.

- Nonconformances need to be tracked across all processes, not just products in manufacturing.
- Most companies have little information about the cost of their business process (front office and/or manufacturing) or what the inputs and outputs are that are part of the process.
- Managers are rated on how much they produce, not how efficiently

they perform product control versus process control.

- Processes must define resource consumption.
- Cost of quality from the consumer viewpoint is called total cost of ownership (just like a car or appliance) or the purchase price plus the costs of operation.
- The most important part of the entire quality costs effort is the ability to determine if the decision made resulted in the expected outcome; was it effective. This requires a before and after view of the business metric.



Source: WarriorNetwork, <https://quizlet.com/522790417/acg2071-chapter-1-diagram/>

Relationship to Lean

The 8 Wastes in Lean (Table 1) are interconnected with the categories of a Quality Cost Model. By identifying and addressing these wastes, organizations can reduce inefficiencies, enhance quality, and ultimately minimize the associated quality costs. Lean principles and a Quality Cost Model (Table 2)

together provide a comprehensive framework for organizations to improve processes, reduce waste, and optimize their overall quality management.

Some companies implement the quality cost calculation (Table 3) at the beginning of the production process and some companies

Table 1: Lean Wastes

|                   |                                                                                                                                                                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Defects           | Prevention costs (e.g., training, quality planning) and appraisal costs (e.g., inspection, testing) are incurred to identify and prevent defects. Internal failure costs (e.g., rework, scrap) and external failure costs (e.g., warranty claims, customer support) result from defects that reach customers.                   |
| Overproduction    | Overproduction can lead to excess inventory, which may become obsolete or require additional handling, storage, and maintenance. Overproduction contributes to inventory costs, which are considered as a quality cost in terms of the financial impact associated with managing and maintaining excessive inventory.           |
| Waiting           | Waiting times can lead to delays in production, impacting overall efficiency and potentially causing downstream disruptions. Waiting contributes to both internal and external failure costs. Delays in production may result in late deliveries, which can lead to customer dissatisfaction and potential financial penalties. |
| Transportation    | Excessive movement or transportation of materials can increase the risk of damage, loss, or errors. Transportation is connected to the risk of defects and damage during movement, contributing to both internal and external failure costs.                                                                                    |
| Inventory         | High levels of inventory can lead to holding costs, the risk of obsolescence, and additional handling and storage expenses. Excessive inventory is directly associated with inventory costs, which are considered as quality costs when assessing the financial impact on the organization.                                     |
| Motion            | Unnecessary or inefficient movements can contribute to fatigue, errors, and potential safety hazards. Motion is connected to the risk of defects and safety concerns, contributing to both prevention and internal failure costs.                                                                                               |
| Excess processing | Unnecessary steps or processes that do not add value can result in wasted resources. Overprocessing can contribute to both internal and external failure costs, as it may lead to defects or unnecessary expenses in delivering products or services.                                                                           |
| Unused Talent     | Underutilizing the skills and capabilities of employees can lead to missed opportunities for improvement and innovation. Underutilized skills can be associated with a lack of employee training and development, which may contribute to defects and errors, leading to both prevention and internal failure costs.            |

Table 2: Common estimates of the distribution of quality costs

| Quality Cost Category           | Definition                                  | Contribution Averages |
|---------------------------------|---------------------------------------------|-----------------------|
| Prevention                      | Costs incurred to prevent problems.         | 5-10%                 |
| Appraisal / Inspection          | Costs incurred to verify no problems exist. | 20-25%                |
| Failure (external and Internal) | Costs incurred fixing problems.             | 60-70%                |



**Table 3: Categories of Costs of Quality**

| Prevention                          | Appraisal                                                            | Internal failure                                                                 | External Failure           |
|-------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------|
| Market Research                     | Inspection and Test – Review of ANY Work                             | Any process that did not work as expected                                        | Warranty Returned Products |
| Training                            | Audits                                                               | Cost to replace/repair<br>(Scrap, rework, repair, return to Supplier, Use as Is) | Debit Memos from Customer  |
| Product Design                      | Evaluation/Assessments/ Surveys<br>(Customers, Employees, Suppliers) | Unscheduled Anything                                                             | Legal Costs                |
| Process Design                      |                                                                      | Equipment Downtime                                                               | Lost Sales                 |
| Equipment Maintenance & Calibration |                                                                      | People Downtime                                                                  | Complaints                 |
| Customer Maintenance                |                                                                      | Missed Delivery Date                                                             |                            |
| Supplier Maintenance                |                                                                      | Employee Turnover                                                                |                            |
| Debit Memos to Suppliers            |                                                                      | Lost Sales to a Competitor                                                       |                            |
| Quality Planning                    |                                                                      |                                                                                  |                            |
| Process Improvements                |                                                                      |                                                                                  |                            |

implement quality cost tracking during pre-production efforts as prevention.

## Story Telling Example

Explanation of quality costs is simplified by comparing it to a similar concept in a different context with which the audience is likely to be familiar. Let's use the analogy of car maintenance to illustrate the cost of quality approach.

Imagine you're explaining the cost of quality approach to a group of business executives, and you want to make it relatable. You could say:

*"Consider the cost of quality in business as similar to maintaining a car. When you invest in regular maintenance, such as oil changes, brake inspections, and tire rotations, you're preventing potential issues that could lead to more significant problems down the road. The money spent on preventive maintenance is comparable to the costs associated with ensuring quality of your products or services."*

*Now, think about what happens if you neglect car maintenance. The initial savings on skipping regular check-ups might seem appealing, but over time, you're likely to face breakdowns, costly repairs, and reduced overall performance. In the business world, neglecting the cost of quality, which involves ensuring our processes and products meet high standards, can result in defects, customer complaints, and expensive corrections.*

*Just as a well-maintained car performs optimally and saves you money in the long run, investing in the cost of quality ensures that your business processes run smoothly, your products meet or exceed customer expectations, and you avoid the costly repercussions of defects and errors. It's a strategic investment that pays off by enhancing customer satisfaction, reducing rework, and ultimately contributing to our bottom line."*

The magic happens when the car maintenance example drives questions like:

- Oil changes – How often? Best oil?

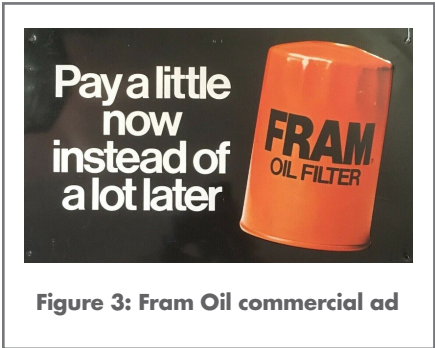


Figure 3: Fram Oil commercial ad

Source: imgflip, <https://imgflip.com/i/41w9a5>

- Tires – Change after how many miles? Best tires? Rotation needed?

It gets better when you start adding what kind of car it is. Who is driving? How long do we expect to drive it? Under what conditions is it being driven? What are my risks?

If the reader is old enough, they will also remember the Fram Oil Filter commercial (Figure 3).

Quality Process Maturity

Quality process maturity refers to the level of sophistication, consistency, and effectiveness of an organization's quality management processes. It is often assessed using a maturity model, which is a structured framework that helps organizations understand and improve their processes over time (Table 4).

Table 4: The current level of maturity impacts the Quality Cost deployment strategy.

|                                            | Low Maturity Levels                                                                                                                                                                                                          | High Maturity Levels                                                                                                                                                                                                                                            |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Understanding and Identifying Costs        | Organizations may have a limited understanding of the true costs of poor quality. The lack of standardized processes and measurement systems makes it challenging to identify and quantify quality-related costs accurately. | Organizations have better-defined processes and measurement systems. This enables them to identify and categorize quality costs more accurately, distinguishing between prevention, appraisal, internal failure, and external failure costs.                    |
| Root Cause Analysis and Corrective Actions | There may be a tendency to address quality issues reactively without a systematic analysis of root causes. Corrective actions may be ad hoc and not necessarily linked to the actual sources of poor quality.                | Focus on root cause analysis and implement corrective actions based on data-driven insights. This approach helps prevent the recurrence of quality issues, reducing the associated costs over time.                                                             |
| Cost Allocation and Prioritization         | May struggle with accurately allocating quality costs to specific processes or products. This makes it difficult to prioritize improvement efforts effectively.                                                              | With well-defined processes and measurement systems, organizations can allocate quality costs more accurately. This allows for better prioritization of improvement initiatives, targeting areas with the highest impact on overall quality and cost reduction. |
| Continuous Improvement                     | Continuous improvement practices may be less ingrained in organizations making it challenging to sustain improvements over time.                                                                                             | Have a foundation for integrating quality costs with continuous improvement initiatives. This creates a cycle of identifying, addressing, and preventing quality issues, leading to a more sustainable reduction in quality costs.                              |
| Cultural Considerations                    | Resistant to change, hindering adoption. Employees may not fully understand the impact of their actions on quality costs.                                                                                                    | A culture of quality and continuous improvement is more likely to exist in organizations with higher maturity levels. Employees understand the importance of their roles in controlling and reducing quality costs.                                             |
| Prevention Efforts                         | Low                                                                                                                                                                                                                          | High                                                                                                                                                                                                                                                            |
| Appraisal Efforts                          | Low                                                                                                                                                                                                                          | High                                                                                                                                                                                                                                                            |
| Failure Results                            | High                                                                                                                                                                                                                         | Low                                                                                                                                                                                                                                                             |

Source: <https://www.drmindle.com/capability-maturity-model-for-data-science-teams>

Another example of a maturity model is the Software industry Capability Maturity Model Integration (CMMI)

## Known Challenges

The study of quality costs literature over the last 70 years resulted in common challenges, including:

**Taking on too much too fast:** Big bang projects take a lot of time and money and often include adding more headcount to staff.

**Focus more on report accuracy than the big picture:** Get the finance and accounting people on board to support the use of estimates—they are OK—like the 1-10-100-rules for engineering changes.

**Resistance to Change:** A big problem for organizations is that employees often don't like change. They're used to doing things a certain way, and if a new business model is introduced, they might see it as a problem. I have found that people do not like change that does not help them. This includes explaining the benefits and reasons behind the quality cost model and giving employees training and support, including involving them in the quality costs allocation process.

**Measuring Intangible Costs:** Some quality costs are not easy to see or measure, like damage to reputation or customer trust. Ignoring these costs can make it hard to fully grasp how quality affects the business. Creating ways to measure and include these less obvious costs in the quality cost business model is an ongoing challenge for organizations. Get your Accounting Department involved.

**Data Collection and Measurement:** Having the right software tool to convert data to useful information. Getting the right data is important for a quality cost business model to work well. However, many organizations have a hard time collecting reliable data on quality-related costs because these costs are spread out in different departments and systems. Setting up a good system to collect all the needed data can take a lot of time and effort. Using technology and automation tools can make this process easier and make the data more accurate.

**Balancing Quality and Cost Objectives:** Balancing quality and keeping costs in check is tricky. Organizations often struggle with deciding where to put resources—whether to improve quality or cut expenses. Solving this challenge needs a smart strategy, looking closely at what gives the best value for money and how it affects the overall quality of the product or service. It also means changing the way the organization thinks, focusing more on long-term quality benefits than short-term cost savings.

## Keys to Success

Ask the people about their processes. Have managers make their own estimates and cost category allocations.

1. Timely reports—Day-to-day decisions cannot be made with monthly/quarterly reports.
2. Simple Reports—Showing direct correlation to a corporate goal.
3. Decision making results tracking—Did it work?

Time lag needs to be understood, especially with external failure data. It takes a supplier cycle for the product to be experienced by the customer and the feedback to reach the producer. Service feedback is a lot faster.

## Strategy – Innovation Versus Continuous Improvement

Big bang or baby steps? Innovation and continuous improvement are both essential concepts for organizational growth and success, but they represent distinct approaches to change and development (Table 5).

While innovation and continuous improvement serve different purposes, both play crucial roles in the overall success of organizations. Balancing both approaches can help businesses stay competitive by fostering a culture of adaptability and responsiveness to change.

**Table 5: Comparison of innovation and continuous improvement**

|                      | Innovation                                                                                                                                                                | Continuous Improvement                                                                                                                                                                                       |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Focus                | Creation and implementation of something new or significantly improved, often introducing novel ideas, products, or processes.                                            | Continuous improvement, also known as incremental or kaizen improvement, focuses on making small, ongoing enhancements to existing processes, products, or services to achieve efficiency and effectiveness. |
| Nature of Change     | Radical or disruptive change, introducing new concepts, technologies, or business models that can transform industries.                                                   | Change is gradual and evolutionary, with a focus on making incremental adjustments to existing processes or products to enhance their performance.                                                           |
| Risk and Uncertainty | Higher degree of risk and uncertainty as it ventures into uncharted territory. There's a possibility of failure, but successful innovation can yield significant rewards. | Generally lower since changes are small and incremental. The emphasis is on minimizing disruptions to existing operations.                                                                                   |
| Timing               | Sporadic and may happen in bursts, sometimes driven by breakthrough technologies, market demands, or visionary leadership.                                                | Ongoing, systematic process that is integrated into the daily operations of an organization. It is a long-term commitment to making steady progress.                                                         |
| Focus                | Creating entirely new solutions, products, or services.                                                                                                                   | Optimizing and refining existing processes, products, or services to improve efficiency, quality, and customer satisfaction.                                                                                 |
| Culture              | Encourages risk-taking, experimentation, and tolerance for failure. It may involve a more entrepreneurial and creative mindset.                                           | Culture of discipline, teamwork, and a commitment to ongoing learning and adaptation. It thrives on the idea that small, continuous changes can lead to significant improvements over time.                  |
| Target               | Narrow                                                                                                                                                                    | Broad                                                                                                                                                                                                        |
| Money Required       | High to very High                                                                                                                                                         | Modest to very little                                                                                                                                                                                        |
| Results              | Spontaneous                                                                                                                                                               | Continuous (Daily)                                                                                                                                                                                           |
| Success metric       | Results                                                                                                                                                                   | Level of Effort. Continuous improvement is also measured by outcomes.                                                                                                                                        |

Tortoise and the hare—small continuous improvement often beats innovation over the long term.

## Quality Costs 4.0 Solution Development

The biggest challenge in developing a robust Quality 4.0 solution for mature organizations is to understand that the traditional restrictions on data access are gone. “Super Cube” data sources provide an unprecedented amount of information. As an example, my daughter is a digital marketing expert in retail. She told me, “Dad, imagine you have access to all credit card

transactions by every person in the world, what would you do with the information?” Another way of asking this is, “What story do you want to tell?”

Think of a Super Cube as a large repository of raw, structured, and unstructured data files stored in their native formats. But while they are extremely flexible and scalable, no business value can be realized from the data until it is accessed and used by data consumers. Though data lakes can support different types of workloads, most data lake consumers still focus on analytics workloads.

A Super Cube that can be created from current business systems, include, but are not limited to:

- ERP—Enterprise Resource Planning - Production costs, inventory management, customer orders and returns, supplier purchases and returns.
- PLM—Product Lifecycle Management - Product stage (new, prototype, pre-production, production, service), bill of materials, engineering changes.
- MES—Manufacturing Execution Systems - Real-time production data, including nonconformance issues, downtime (production and maintenance).
- CMM—Coordinate measurement machines and all other inspection systems collecting data.
- QMS—Quality Management Systems

- CRM—Customer Relationship Management - Customer feedback, complaints, service requests, internal lost sales review.
- Labor reporting/time sheets—This allows employees to be aware of their impact on quality costs.
- Expense reports—Often overlooked, such as customer and supplier meetings.
- Social Media sites

Logical versus Physical Data

Part of the required paradigm shift to Quality 4.0 is to design the system from a logical view, the story telling, not the typical physical database model. Logical data and physical data (Table 6) are two distinct but interconnected aspects of a database

Table 6: Physical versus Logical Data

|             | Physical Data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Logical Data                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Definition  | <p>Physical data represents the actual storage and implementation of data on a computer system, considering factors such as file structures, indexing, and storage mechanisms.</p> <p>It is concerned with how data is stored, accessed, and retrieved from storage devices.</p> <p>Physical data models consider factors like data types, indexing strategies, partitioning, and storage optimizations. It involves decisions about file structures, storage devices, and other technical aspects necessary for data retrieval and manipulation.</p> | <p>Logical data represents the abstract representation of data, emphasizing how data should be perceived and understood by users and applications.</p> <p>It focuses on the relationships between data entities, their attributes, and the rules governing those relationships.</p>                                                                                                                                                     |
| Abstraction | <p>Physical data deals with the concrete implementation details that are necessary for the efficient storage and retrieval of data.</p>                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Logical data provides a high-level abstraction that is independent of specific technologies or implementations.</p> <p>Abstract concepts such as tables, entities, attributes, and relationships are defined without concern for how the data is stored or accessed physically.</p> <p>Logical data models, such as Entity-Relationship Diagrams (ERD), depict the structure of the data and the relationships between entities.</p> |

Table continued on page 10

|                  |                                                                                                                                |                                                                                                                                                                                                                                                                                       |
|------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relationship     | The physical data model is derived from the logical model but includes additional details to optimize performance and storage. | The design process typically begins with a logical data model that captures the conceptual structure of the data.                                                                                                                                                                     |
| User Perspective | They do not see it and really don't care.                                                                                      | Logical data is designed to be easily comprehensible to users, business analysts, and other stakeholders who may not have a technical background.<br><br>It provides a high-level view of the data and its organization without delving into the technical details of implementation. |
| Example          | In a physical model, entities like Supplier are defined by a mailing address, contact information, contacts.                   | In a logical data model, you might define entities like "Supplier" and "Non-Conformances, Corrective Actions, Engineering Changes, etc." their attributes, and the relationships between them without specifying how the data will be physically stored.                              |

system. They represent different views of the same data, and understanding their differences is crucial in the design, development, and management of databases.

Logical data focuses on the conceptual representation of data, emphasizing relationships and entities, while physical data deals with the concrete implementation details required for efficient storage and retrieval. Both perspectives are integral to the overall database design and management process, with the logical providing a user-friendly abstraction and the physical addressing the technical requirements of storage and retrieval.

My first exposure to the logical view was as the project manager for a major aerospace company in the mid-80s (Figures 4 and 5). The project was funded by Wright Patterson Air Force Base in Dayton Ohio (WPAFB). The project scope was to define the business

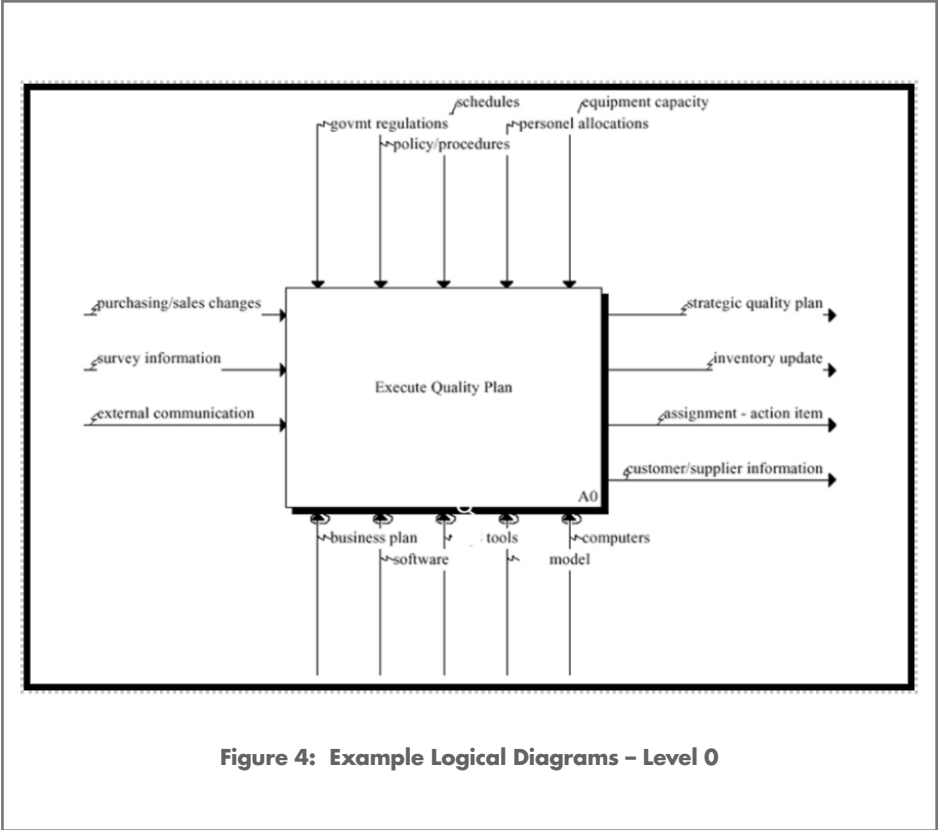
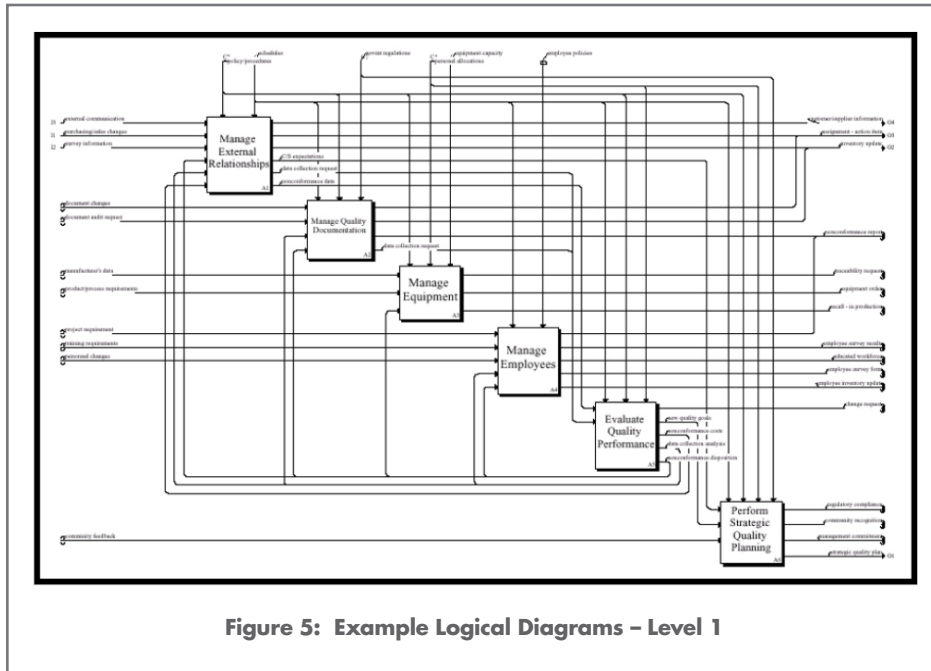


Figure 4: Example Logical Diagrams – Level 0



processes needed by an aerospace manufacturing company, excluding inventory and accounting transactions as MRP software existed at that time.

## Level of Difficulty

The business status of a company influences the feasibility, priorities, and challenges associated with implementing a quality cost plan. Consideration of financial resources, organizational culture, management commitment, operational efficiency, regulatory environment, market competitiveness, and customer satisfaction is very important in tailoring the plan to the specific needs and circumstances of the company.

**ROI:** The return on investment is often difficult to articulate to the satisfaction of the financial community.

**Financial Resources:** The financial health of a company plays a crucial role in the implementation of any plan, including a quality cost plan. A company with robust financial resources may find it easier to allocate funds for quality improvement initiatives, training programs, and necessary infrastructure.

**Organizational Culture:** The existing culture within the organization can influence how well a quality cost plan is received and embraced by employees. A company with a strong quality-oriented culture may find it easier to implement such a plan, while a company with a resistance to change might face

challenges in getting employees on board.

**Management Commitment:** The commitment of top-level management to quality initiatives is critical. If leadership is fully supportive and actively involved in the quality cost implementation plan, it is more likely to succeed. Conversely, a lack of commitment or interest from management can hinder the successful execution of the plan. Remember, telling a story about what makes business goals happen, the cause and effect, discussed in terms of money, is how you get management commitment.

**Operational Efficiency:** The efficiency of current business processes and operations can impact the effectiveness of a quality cost plan. If a company is already struggling with operational inefficiencies, implementing a quality cost plan might require addressing underlying process issues first.

**Regulatory Environment:** Depending on the industry, companies may operate within a regulatory environment that mandates certain quality standards. The current regulatory landscape can influence the urgency and specific requirements for implementing a quality cost plan.

**Market Competitiveness:** The competitive landscape of the market can drive companies to invest in quality improvement initiatives to stay competitive. A company facing intense competition may prioritize the implementation of a quality cost plan to enhance its products or services.

## Customer Satisfaction and Reputation:

The current level of customer satisfaction and the overall reputation of the company are important factors. A company with a strong reputation for quality may be more motivated to maintain and improve its standing, while a company facing customer dissatisfaction may see the quality cost plan to regain trust.

A business can be in a dynamic or stable status and is better understood by reviewing changes to:

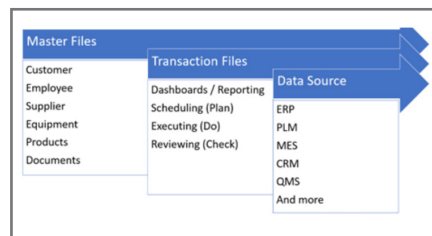
- Product mix
- Product composition and complexity
- Production processes
- Market expectations
- Make versus buy decisions.
- Prices of raw materials

The business process approach is often difficult as ownership of the above

| Data Sources       |
|--------------------|
| Enterprise Systems |
| Legacy Systems     |
| Point Solutions    |
| Cloud/Web Services |
| Files              |

| Data Management |
|-----------------|
| Collection      |
| Preparation     |
| Visualization   |
| Analysis        |

| Story Telling                                |
|----------------------------------------------|
| Descriptive - What happened?                 |
| Diagnostic - Why did this happen?            |
| Prescriptive - What should we do next?       |
| Predictive - What might happen in the future |



decisions is highly distributed across multiple departments.

**Data Sources** – integration for data exchange to the quality cost accumulator provides a more holistic approach.

## Harrington Quality Cost Accumulator (Figure 6)

The proprietary Harrington Quality Cost Accumulator is the result of extensive research on the best data scientist deployment models using decades of experience with quality costs reporting.

**Data Warehouse:** A data warehouse is a centralized repository that is used for storing and managing large volumes of structured data from various sources within an organization. The data in a data warehouse is typically organized, transformed, and optimized for reporting and analysis. It provides a consolidated view of historical and current data, making it easier for decision-makers to

access and analyze information. Data warehouses are often used for business intelligence, reporting, and data analysis purposes.

**Data Lake:** A data lake is a storage system or repository that can hold vast amounts of raw, unstructured, semi-structured, and structured data. Unlike a data warehouse, which imposes a structure on the data before storage, a data lake allows for the storage of diverse data types in their native formats. This flexibility makes data lakes suitable for storing large volumes of data, including data that may not have a predefined schema. Data lakes are designed to support advanced analytics, data exploration, and big data processing.

**Costs Catalog** provides an effective way to search and discover data within a data lake. Not only can employees find the data they need by browsing semantic objects (categories, tags) or via Google-like searches, but the catalog's built-in artificial intelligence (AI) capabilities can even recommend data lake assets.

By streamlining the process of data cataloging and data provisioning you can move the focus from collecting data to connecting to and using data lake data and help employees develop a data accumulator that can easily deliver data products to multiple roles regardless of whether the underlying data originated from a data lake or a data warehouse.

**Cost Driver Catalog** defines how costs are applied and will vary based on business status. The effort needs to focus on the cause-and-effect relationship on company

goals, which impacts management decisions.

Cost drivers are factors that significantly influence or determine the expenses incurred by a business. These drivers have a direct impact on the cost of producing goods or services. Understanding them is crucial for effective cost management. By identifying and analyzing cost drivers, businesses can make informed decisions to control and optimize their operations. When creating the quality costs process, it is important to understand that not all drivers behave in the same manner.

**Volume-Based:** Directly related to the quantity or volume of units produced or services provided. Examples include the number of units produced, machine hours, or direct labor hours.

**Transaction-Based:** Costs are driven by the number of transactions or events. For instance, the number of engineering changes processed, or the number of corrective actions issued.

**Duration-Based:** Time-related factors, such as the time spent on a particular activity. This might include hours of

machine usage or time spent on new product development.

Examples include a definition of several complex business models that allow configuration based on each company's decisions, for example:

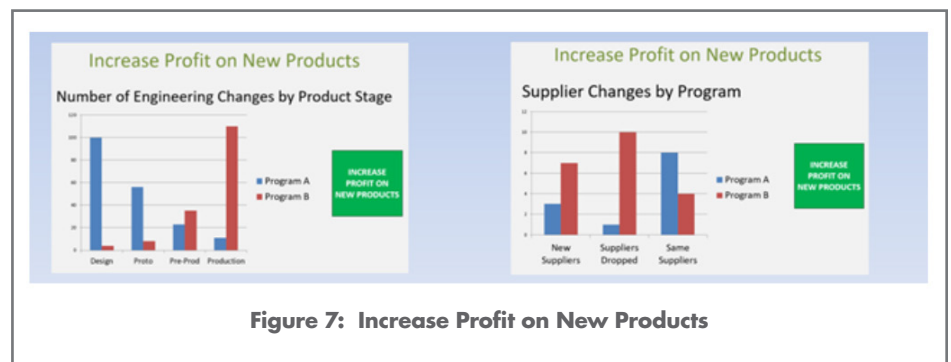
- Distribution of fixed versus variable costs.
  - Use of allocation versus actual transactions on fixed costs
  - Use of allocation versus actual transactions on variable costs
- Ability to define multiple measurement bases and how they are applied.
- Cross-tracing across all records by employee, customer, supplier, product, or equipment
- Collection Frequency – real-time, weekly, monthly
- Quality costs time lags follow the product lifecycle – design, production, consumption.
- Ability to include or exclude drivers in calculations.

Do not ask people to do more work on current data sources. To get started, send the transaction to the data accumulator, and let a person assign cost category distribution and over time, AI will learn by watching usage trends, like what questions people are asking about the data.

Think of the story you want to tell: quality professionals possess more analytical tools and expertise than most employees. Sharing these talents will provide better insights into all processes and products in an enterprise that enables consistently better decision-making, shown in Figure 7.

As a quality professional, you probably already know that having most of the ECRS during production is more expensive than in the design phase. You probably already know that changing suppliers strictly on purchased part cost is often more expensive.

The Quality Cost system should be driven by data democratization, which is the process of making data and information more accessible and available to a broader audience within an organization or society. The goal is to empower individuals across various levels and



departments to access, use, and interpret data without relying heavily on specialized technical skills or expertise. In essence, it aims to break down traditional data silos and ensure that data is not confined to a select few individuals or teams.

## Quality Cost System Deployment Plans

Start slow and improve over time. Initial focus on failure costs by a single department or product line is a good idea. Focus on early wins (you know where they are!). Build into other areas over time. Big Bang projects often explode!

Creating a Quality Cost System Deployment Plan involves several key steps to ensure successful implementation. Below is an example plan that outlines the necessary actions and considerations for deploying a quality cost system:

1. **Define Objectives and Scope:** Clearly articulate the goals and objectives of implementing the quality cost system. Define the scope of the deployment, including the processes and departments it will cover.
2. **Conduct Stakeholder Analysis:** Identify key stakeholders, including management, employees, and any external parties involved. Understand their expectations and concerns regarding the quality cost system.
3. **Allocate Resources:** Determine the budget, human resources, and technology required for the deployment. Ensure that all necessary resources are secured and available.
4. **Select Quality Cost System Software:** Research and select a suitable quality cost system software based on organizational needs and compatibility. Ensure that the chosen software aligns with industry standards and regulatory requirements.
5. **Configure Software Tools:** Work with the software provider to customize the system to meet specific organizational requirements. Configure the software to integrate with existing systems and databases.
6. **Training and Education:** Develop a comprehensive training program for employees at all levels. Provide training sessions on how to use the quality cost system effectively.
7. **Communication Plan:** Develop a communication plan to keep all stakeholders informed throughout the deployment process. Clearly communicate the benefits of the quality cost system and address any concerns.
8. **Pilot Testing:** Conduct a pilot test of the quality cost system with a small group of users. Gather feedback, identify issues, and make necessary adjustments before full-scale deployment.
9. **Rollout Plan:** Develop a phased rollout plan to gradually implement the quality cost system across the organization. Monitor progress and address any issues as they arise during the rollout.
10. **Monitoring and Evaluation:** Establish key performance indicators (KPIs) to measure the effectiveness of the quality cost system. Regularly monitor and evaluate the system's performance, making improvements as needed.
11. **Continuous Improvement:** Implement a process for continuous improvement based on feedback and performance metrics. Regularly update the system to incorporate new features and address emerging needs.
12. **Documentation and Reporting:** Develop documentation for users on how to use the quality cost system. Implement a reporting mechanism to generate regular and timely reports on quality costs and trends.
13. **Compliance and Auditing:** Ensure that the quality cost system complies with relevant industry standards and regulations. Establish a process for internal and external auditing to verify the accuracy and integrity of the data.
14. **Post-Deployment Support:** Provide ongoing support for users after the full deployment. Establish a help desk or support system to address user queries and issues promptly.
15. **Review and Adapt:** Conduct regular reviews of the quality cost system's performance and adapt the deployment plan, as necessary.

By following this comprehensive deployment plan, organizations can increase the likelihood of successful implementation and maximize the benefits of a quality cost system. Adjustments may be necessary based on the unique characteristics and requirements of each organization.

A mature quality system may require more advanced features, integration capabilities, and alignment with existing processes, while an immature system may need a more foundational approach with an emphasis on education, basic integration, and continuous support for users. The key is to tailor the deployment plan to the organization's specific needs and maturity level.

## Mature Quality System Planning

1. **Assessment of Current Quality System:** Conduct a thorough assessment of the existing quality management system to identify strengths and weaknesses. Determine how the quality cost system can integrate with and enhance the current processes.
2. **Integration with Existing Systems:** Ensure seamless integration with other mature quality management tools and systems. Consider how the quality cost system can leverage existing data and reporting structures.
3. **Employee Training on New Features:** Focus on training employees on the new features and enhancements brought by the quality cost system. Emphasize how the system will complement and improve their existing workflow.
4. **Continuous Improvement Alignment:** Align the quality cost system with the organization's existing continuous improvement initiatives. Leverage data from the quality cost system to further enhance ongoing improvement efforts.
5. **Advanced Reporting and Analytics:** Implement advanced reporting and analytics features, taking advantage of the organization's data maturity. Enable the generation of in-depth reports for strategic decision-making.
2. **Integration with Basic Quality Processes:** Integrate the quality cost system with fundamental quality processes. Emphasize simplicity in the initial integration to avoid overwhelming users.
3. **Emphasis on Standardization:** Place emphasis on standardizing processes as part of the quality cost system deployment. Establish foundational quality standards and procedures.
4. **Basic Reporting and Monitoring:** Implement basic reporting and monitoring features to track essential quality metrics. Focus on building a foundation for future data-driven decision-making.
5. **Incremental Rollout:** Adopt an incremental rollout strategy, starting with a pilot phase in one or a few departments. Learn from initial deployments and gradually expand to other areas of the organization.
6. **Continuous Training and Support:** Provide continuous training and support to help employees adapt to the new quality cost system. Recognize that ongoing education is crucial for an immature quality system.
7. **Adaptability for Growth:** Design the quality cost system with scalability in mind, allowing for easy adaptation as the organization's quality management maturity grows.

## Immature Quality System Planning

1. **Foundational Training:** Start with foundational training on basic quality management principles for employees. Introduce the quality cost system as part of a broader quality management education initiative.

## Conclusions

Implementing a Quality Cost 4.0 Information Utility Business Model is a complex task that needs a smart and all-encompassing strategy. To succeed, it's vital to address challenges such as resistance to change, data collection, balancing quality and cost goals, system integration, and measuring intangible costs. Overcoming these challenges is key to enjoying the lasting advantages of better quality and cost management. Organizations that handle these issues well set themselves up for long-term success in a competitive business environment.

Coming Soon:

- What are the top 10 cause-and-effect drivers for common business goals?

- Examples of metrics by job title
- Profit prediction models based on past performance
- Gamification ideas

## Author Bio

**John M. Cachat** is a visionary and an expert in developing innovative information technology approaches for large and small companies and is currently an executive with Harrington Group International. He specializes in strategies to integrate ERP, PLM, MES, and QMS technologies. John holds an MSIE degree from Texas A&M University, specializing in automated manufacturing and is recognized as one of the Top 100 Fast Growing Aggie Owned Companies. In addition, he led the ASQ Quality Management Division Technical Committee on "Quality Information Systems" and is the past chairman of his local ASQ Chapter. John is a member of the current ASQ Quality Management Division Technical Committee on "Quality 4.0." John welcomes LinkedIn invites for anyone looking to learn more - <https://www.linkedin.com/in/johncachat/> and can also be contacted at [jcachat@hgint.com](mailto:jcachat@hgint.com)

## Chair's Message | Ellen Quinn

Hello, Quality Management Division (QMD) members!

The year has passed by quickly, welcome to the fourth quarter *Forum* issue. I want to take this opportunity to follow up on some of our 2024 focus areas and to recognize some of our fantastic QMD Council members.

In earlier Chair's messages, I mentioned that two of our focus areas for 2024 were *Member Connections* and *Collaboration*, for which I would like to briefly summarize a few accomplishments. Member Connections: Luis Morales (Chair Elect) and I interviewed several QMD members for volunteer positions. We had the opportunity to interact with members from different parts of the world. I am pleased to announce that a result of our connections made, and meetings held, we were able to fill all but one of our open QMD Council positions. The following members have joined the QMD Council:

Abbigail Ali and Michelle Potvin, Vice Chairs, Member Leaders

Susan Samaroo, NextGen Committee

Dr. Herman Tang, Subject Matter Expert (SME) resource for all CMCs

Seetharam Kandarpam, CMC Lead for Customer Focused Organizations

Sebastian Pop, CMC Lead for Management Elements and Methods

(Nathan) Balan Vaithyanathan, Ebased Initiatives Committee

Please join me in welcoming all new QMD Council member volunteers!

**Collaboration activities:** the planning and establishment of the Joint Divisions' Virtual Conference Committee, an effort that includes a partnership with five divisions: Quality Management, Software, Energy and Environment, Design and Construction, and Government. The Co-Chairs are April Thomas Schmidt and David Larsen. Many other divisions will be participating either by submitting proposals for sessions or as a sponsor. The Virtual Conference will be held on July 22, 23 and 24, 2025. Watch for more information on this event.

**Recognition of QMD Council members:** since this is the last *Forum* issue of 2024, I would like to recognize the achievements of the following QMD Council members and their respective awards:



Ellen Quinn  
ASQ Quality Management  
Division Chair, 2024-2026

**Denis Devos** – Paul Gauthier Award. presented at the 2024 ASQ Audit Conference

**Grace Duffy** – myASQ Community Member Spotlight article in the ASQ Insider (September 2024)

**Dr. Sandy Furterer** – co-author, Book of the Year Award for Lean Sustainability: A Pathway to a Circular Economy from the International Lean Six Sigma Institute (ILSSI)

**Susan Gorveatte** – Simon Collier Award, ASQ LA Section, September 2024

**Jd Marhevko** – Simon Collier Award, ASQ LA Section, November 2024

Testimonial Awards presented to the following long-time QMD members assisting with the QMD Forum: Deepak Dave, Pradip V. Mehta, and Mustafa S. Shraim.

Before the end of 2024 we are planning to hold an all QMD member Town Hall – be sure to watch for your invite. I look forward to talking with you then. And be sure to join us at any of our upcoming Webinars and next year in Denver, Colorado, at the ASQ World Conference.

If you have any questions please contact me at [ecquinn@comcast.net](mailto:ecquinn@comcast.net).

I hope you all have safe and Happy Holidays!

Ellen Quinn, Chair  
Quality Management Division

## Editor's Notes | David D. Larsen | Sandy L. Furterer

Welcome to the Winter 2024 issue of *Quality Management Forum*. As 2024 comes to a close, I encourage you to take time to reflect on and celebrate both your professional and personal accomplishments.

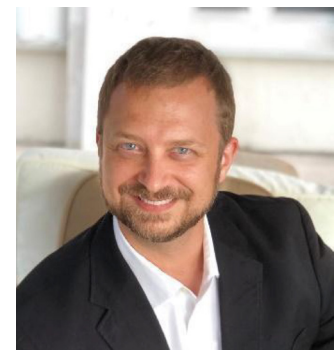
In this issue, we've assembled three quality articles spanning topics of dashboards, curriculum planning, and quality cost. "Quality Cost 4.0, From Theory to Deployment," by John M. Cachat, discusses a Quality Cost 4.0 Information Utility Business Model, a complex task that needs a smart and all-encompassing strategy. "An Outline for Curriculum Planning," by Grace L. Duffy, conveys a structured sequence for curriculum planning, which provides a standard, whether dealing with processes or outcomes and specifies a desired level of quality or results for actions within the learning system. "Harnessing Efficiency and Insight: The Case for Data Dashboards," by Darrel Whiteley, discusses dashboard development allowing organizations to focus on the vital metrics which drive performance.

The Chair's Message by Ellen Quinn follows up on 2024 focus areas, recognizes several QMD member accomplishments, and announces the Joint Divisions' Virtual Conference to be held July 2025. Stay tuned for a QMD member Town Hall before the end of 2024.

Do you have a story to tell? Reach out with your draft article or share your feedback with QMD publications for the improvement of our division. Please connect and correspond with me on LinkedIn, [www.linkedin.com/in/davidlarsen](https://www.linkedin.com/in/davidlarsen).



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# An Outline for Curriculum Planning

By Grace L. Duffy, CMQ/OE, LSSMBB, MBA, FASQ

## Introduction

Curriculum planning takes more than reading an equipment maintenance manual or the leadership book introduction. Establishing and maintaining an exceptional learning system requires a systematic training function.<sup>1</sup> This need not be complex. It is a role within the training and development department. The championing of this training function comes from the same executive team that sets the strategic goals of the organization. The curricula that support competencies within the organization must be aligned with organizational outcomes to meet both customer and internal expectations. Curriculum planning begins with reviewing the competencies required to meet customer needs. Customer needs are one of the inputs to the strategic planning process.

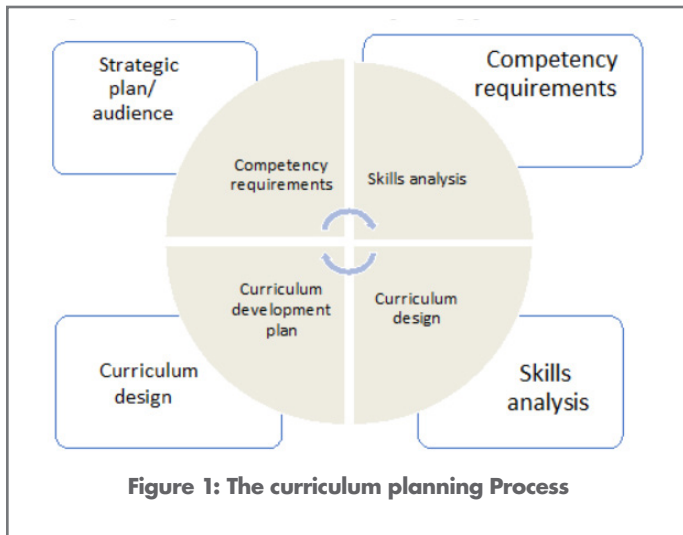
The ASQ Certified Manager of Quality/Organizational Excellence (CMQ/OE) body of knowledge (BoK) calls out training and development as a critical skill for effective quality management. The BoK section VII addresses three phases of curriculum development: training plans, training needs analysis, and training effectiveness and evaluation.<sup>2</sup> Figure 1 illustrates a high-level sequence of the curriculum planning process.

Following a structured sequence for curriculum planning provides a standard, whether dealing with process or outcome and specifies a desired level of quality or results for actions within the learning system.



### Grace L. Duffy

Grace L. Duffy has 45 years of success in business and process management. She spent 20 years with IBM, retiring as head of corporate technical education. Grace was Department Head for Business and Dean of Economic Development for Trident Technical College in South Carolina. She was president and CEO of the Trident Area Community of Excellence in Charleston, South Carolina before moving to Florida to pursue independent contract work in quality and leadership. Grace uses her experience as president, CEO, and senior leader to help organizations improve. She is a Lean Six Sigma Master Black Belt, ASQ CMQ/OE, CQA, SSGB, and CQIA. Grace is an ASQ Fellow and a Distinguished Service Medalist. She has written 18 texts and over 260 papers and articles on quality, leadership, and organizational performance. Grace can be reached at [grace683@outlook.com](mailto:grace683@outlook.com).



## Getting Started

The first phase of the CMQ/OE BoK (see Figure 2) gives training plan requirements. A critical component is to align the plan with the organization's strategic goals. As shown in Figure 1, the objective is to identify the required competencies that generate effective organizational outcomes. These outcomes include all forms of competencies, technical, leadership, administrative, and behavioral. Instructional systems literature refers to this breadth of competencies as knowledge, skills, and attitudes (KSAs). An expanded version for identifying competencies is known as the KESAA (knowledge, experience, skills, aptitude, and attitude).<sup>3</sup> A curriculum request may come directly from strategic planning activities, or a section of the organization experiencing gaps in their ability to meet customer needs.

### ASQ CMQ/OE Section VII, item A: Training Plans

*Develop and implement training plans that are aligned with the organization's strategic plan and general business needs, including leadership training and alignment of personal development plans.*

**Figure 2: ASQ CMQ/OE BoK section describing knowledge requirements for a training plan.**

The ASQ CMQ/OE BoK does not break out the knowledge requirements for curriculum design. The Association for Training and Development (ATD) publishes an extensive Talent Development Capability Model that features three domains of practice:

- Building Personal Capability
- Developing Professional Capability
- Impacting Organizational Capability

Within the three domains are 23 capabilities that span a broad spectrum of disciplines that, when integrated and leveraged holistically, enable professionals to effectively develop employees in the workplace. Each capability is further broken down into knowledge and skills statements, with 186 total across the entire model. Curriculum planning and development are covered as part of the impacting organizational capability domain.<sup>4</sup>

The following is an overview of aligning the curriculum to organizational goals:

- Purpose:** To establish the goals and business case for a curriculum planning and development request, by doing the following:
1. Review the request.
  2. Establish a goal.
  3. Prepare a project plan.
  4. Prepare the business case.
- Outcome:** Identify goals and business case, including:
- Statement of business needs
  - Review of existing curriculum
  - Learner group identification
  - Project plan and budget
  - Cost justification<sup>5</sup>

## Analysis

The information received from strategic planning is analyzed to understand the audience, tasks to be performed, and the content required. This information comes from multiple sources. The

strategic plan is one. Subject matter expert focus groups, direct job observation, job descriptions, benchmarking, and operations manuals are other sources. Terminal objectives of the curriculum drive the content choice to achieve required KSAs.

Needs assessment and needs analysis are different activities. A needs assessment comes before a needs analysis. The assessment is part of phase 1, Getting Started, which occurs during strategic planning. Instructional designers identify business needs and prioritize them through a needs assessment and then analyze the assessment to understand the need, its causes, and potential solutions.<sup>6</sup>

Figure 3 provides the ASQ CMQ/OE BoK section describing the requirements for a training needs analysis. The CMQ/OE Handbook<sup>7</sup> includes further information intended to prepare quality professionals to become certified in the CMQ/OE BoK.

*ASQ CMQ/OE Section VII, item B: Training Needs Analysis*

*Use various tools and techniques such as surveys, performance reviews, regulatory guidance, and gap analyses to identify and assess training needs.*

**Figure 3: ASQ CMQ/OE BoK section describing knowledge requirements for training needs analysis.**

The ATD Talent Development BoK describes Task Assessment or Job Analysis as:

“As the systematic identification of the items necessary to perform any job, such as skills, knowledge, tools, conditions, and requirements. Task assessments can vary in complexity and scope. For instance, one could accurately document a simple set of tasks by interviewing current employees. Task assessments may also require data-gathering sessions to identify all the components of a complex job or a position undergoing change.”<sup>8</sup>

The following is an overview of the analysis phase:

**Purpose:** To identify educational needs to be met by the curriculum and to group the tasks and content into courses, by doing the following:

1. Prepare an analysis plan.
2. Collect and summarize data.
3. Conduct task analysis.
4. Write terminal objectives.
5. Conduct content analysis.

**Outcome:** Identified educational needs and documentation of the analysis process, including:

- Analysis plan
- Learner group profile
- Data reports
- Task hierarchy
- KSA requirements
- Terminal objectives
- Content areas
- List of existing resources

## Curriculum Design

Once the skills and audience analysis are complete, the content scope can be identified. Is the intent to provide minimal understanding or in-depth ability? The terminal objectives set by the business need and learner group identification in phase 1 drive the level of KSAs required.

To meet organizational requirements, training, and development (TD) professionals should think beyond the learning event itself and expand the design expectations. Whether it's an informal peer feedback group or a formal online class, TD professionals consider what must happen before to ensure participants are prepared and what must happen after to ensure they are contributing to the intended organizational goals.<sup>9</sup>

The following is an overview of the Curriculum Design phase:

**Purpose:** To design a curriculum to meet the educational needs by doing the following:

1. Write course descriptions.
2. Produce a curriculum map.
3. List assumptions

**Outcome:** The curriculum design, including:

- Assumptions
- Objectives and content grouped into courses
- Curriculum map
- Delivery system specifications
- Evaluation strategy
- Course descriptions and objectives.

## Curriculum Development Plan

Once the concepts and syllabi are finalized, it is time to make the product real. By now, the training developers should have chosen the textbooks and solidified the sequence of the curriculum. Must the content stream be single-threaded, or can some courses run in parallel? In the sidebar example, the Quality Certificate

curriculum was designed to be completed in three semesters, taking two classes each semester.

**Purpose:** To establish the development plan for the curriculum and to obtain plan approvals, by doing the following:

1. Estimate costs.
2. Prepare a development plan.
3. Prepare final curriculum.
4. Obtain approvals.

**Outcome:** The curriculum development plan, including:

- Estimated development and maintenance costs.
- Final report
- Prioritized list and schedule of course development projects
- Review plan and approvals.

The following is an overview of the curriculum development phase:

## Training Effectiveness and Evaluation

Although this phase is the last in the sequence of curriculum planning and development, its activities occur in each of the

When the author assumed responsibility for the **Quality Certificate** curriculum for the State of South Carolina some years ago, she was given six partially completed course syllabi. The previous developer had performed the business case, and audience analysis, and organized the KSAs into six content areas. Two of the six content areas were developed into courses and piloted the previous semester. A local quality consultant had stepped in to teach the second two classes for the spring semester. The author was hired four weeks before the start of the spring semester and took over the final development of the two currently running classes and the final two courses scheduled for the summer semester. It was a challenging first assignment for a new faculty member at the college.

*Level 1 Reaction* measures how participants react to the training (e.g., satisfaction). *Level 2 Learning* analyzes if they truly understood the training (e.g., increase in knowledge, skills, or experience). *Level 3 Behavior* looks at whether they are utilizing what they learned at work (e.g., change in behaviors), and *Level 4 Results* determines if the material had a positive impact on the business/organization.<sup>10</sup>



**Figure 4: Kirkpatrick's 4 levels of training effectiveness.**

phases. As shown in Figure 4, evaluation occurs operationally and strategically.

Levels 1 and 2 evaluation instruments are created during course development based on specific KSAs covered. Level 3 expectations of behavioral change after training are set during Phase 1 needs analysis and assessment. The long-term outcomes realized for the business in Level 4 are the true drivers of an effective curriculum and are set during strategic planning.

Figure 5 provides the ASQ CMQ/OE BoK knowledge requirements for this phase. Waiting until the curriculum plan is designed and developed is too late to set an evaluation strategy. This strategy should be defined at the same time as the objectives for the curriculum. Define what KSAs are required during analysis and assessment and immediately identify how to measure the attainment of the KSAs. The outcome objectives and

*Assess training effectiveness and make improvements based on feedback from training sessions, end-of-course test results, on-the-job behavior, or performance changes, and departmental or area performance improvements.*

**Figure 5: ASQ CMQ/OE Section VII, item D: Training Effectiveness and Evaluation**

measures are then distributed among separate courses during the curriculum design phase. The results of all four levels are used as improvement feedback for both the students and the designers.

**Purpose:** To formulate the goals and plan the evaluation, by doing the following:

1. Identify evaluation goals.
2. Define the evaluation strategy

**Outcome:** An evaluation strategy, including:

- Evaluation goals
- Identification of information needed
- Focusing questions for each of the levels of
- evaluation within the training
- Evaluation strategy.

The following is an overview of the training effectiveness and evaluation phase:

Evaluation Strategy:

## Conclusion

Following a structured sequence for curriculum planning provides a standard, whether dealing with process or outcome and specifies a desired level of quality or results for actions within the learning system. This paper gives an effective sequence including reference to ASQ and ATD resources for further learning. A successful training program starts with alignment to organizational strategic outcomes. Design and development cascade from goals to objectives, to content, to evaluation and feedback. Good curriculum planning sets the foundation for solid competencies to meet organizational goals.

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# Harnessing Efficiency and Insight: The Case for Data Dashboards

By Darrel Whiteley

In our fast-paced business world, the clarity provided by data dashboards is invaluable. Think of these tools as the window through which you can view the entire landscape of your company's performance data. They do more than just show numbers; they transform them into clear, actionable insights.

## Information at a Glance

For teams buried under data from multiple sources, dashboards can cut through the clutter, as shown in Figure 1. Imagine a system that brings supplier delivery times into sharp focus, instantly revealing any delays. This isn't just about data visibility—it's about enabling quick, informed decisions without the need to wade through endless reports. It's the kind of tool that puts knowledge right at your fingertips, empowering your team to act swiftly to keep supply chains running smoothly.



### **Darrel Whiteley**

*Darrel Whiteley is a principal with Firefly Consulting and has worked in process improvement for over 20 years. He is a Master Black Belt, Lean Master, and Kaizen expert, and has trained and coached over 900 practitioners around the world. Previously a director with George Group Consulting and Tech Center manager at Dow Chemical, he holds the US and international patents for the hydrogenolysis of methyl chlorosilane direct process residue. Darrel can be reached at [Darrel@firefly-consulting.com](mailto:Darrel@firefly-consulting.com)*

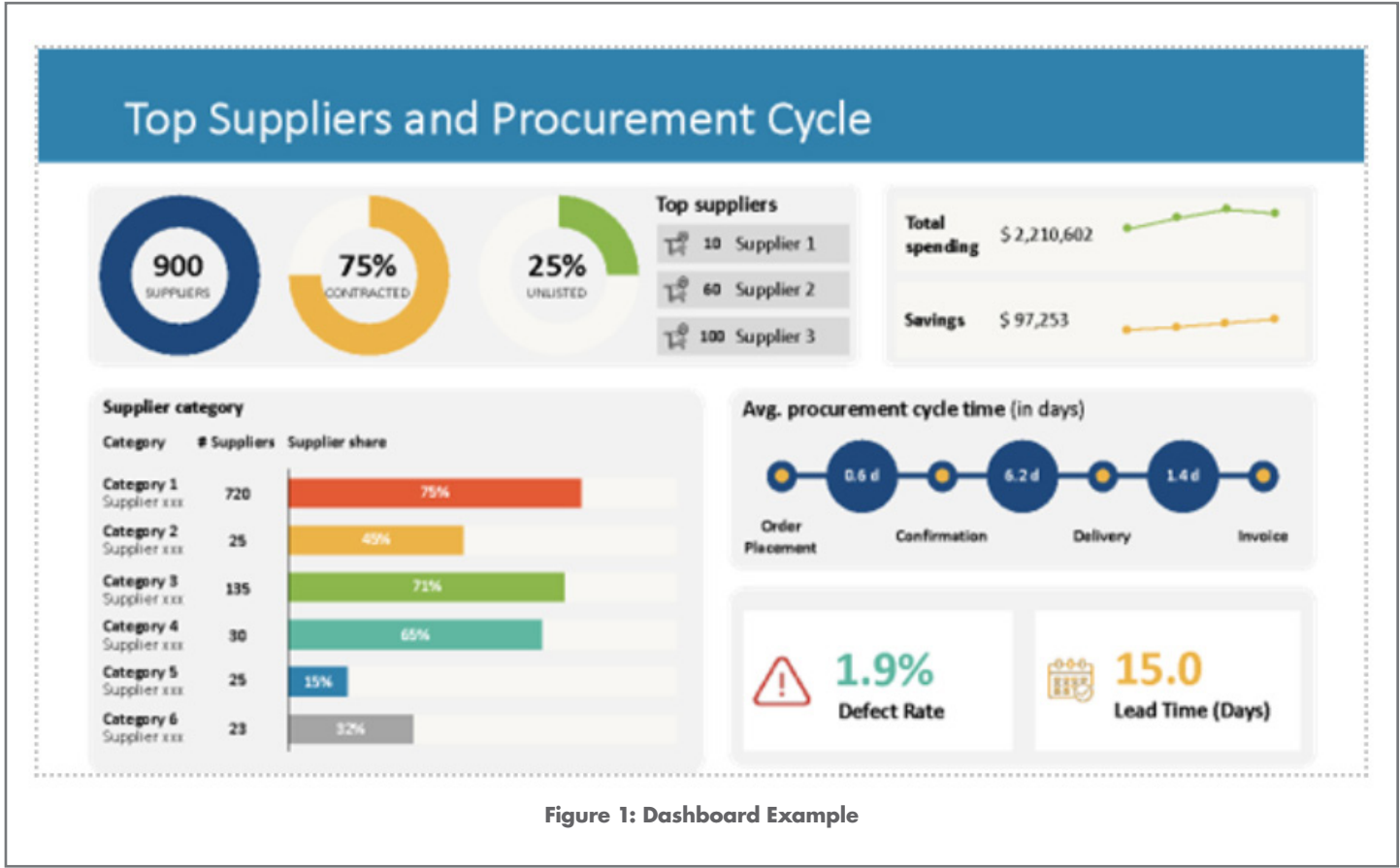


Figure 1: Dashboard Example

A system's true value lies in its customization and relevance. Different departments, from engineering to sales, have unique data needs and priorities. A well-designed tool acknowledges these differences, offering information that's not only useful but immediately engaging. For the procurement sector, such a system could keep a close eye on vendor performance, cost savings, and lead times, providing insights that sharpen negotiation tactics and supplier choices.

### Balancing Detail and Overview

Creating an impactful system is a journey of refinement. It begins with a basic model, perhaps one that tracks order status and quality defects, and evolves based on feedback, eventually incorporating advanced features such as predictive analytics for demand forecasting. This process mirrors the development of a new product, gradually

taking shape from initial, broad concepts to a precise tool refined through user interaction. This means a system that adapts and grows with the team's shifting needs.

Finding the perfect balance between detail and accessibility is key. An effective tool starts with a broad overview of a key metric, for example spending by category, and then allows for deeper exploration, such as examining expenses with specific suppliers. This approach presents

essential metrics in a digestible format, inviting further investigation without overwhelming users with information.

Integrating data from various systems is crucial to ensure accuracy and reliability. Mismatches in inventory levels can lead to significant issues such as overstocking or stockouts. The answer lies in establishing solid data validation and reconciliation protocols, guaranteeing that the system reflects a single, accurate reality. A comprehensive system that pulls real-time data from inventory, purchasing, and finance systems offers a unified view of stock levels, significantly enhancing inventory management practices.

## Measuring Success

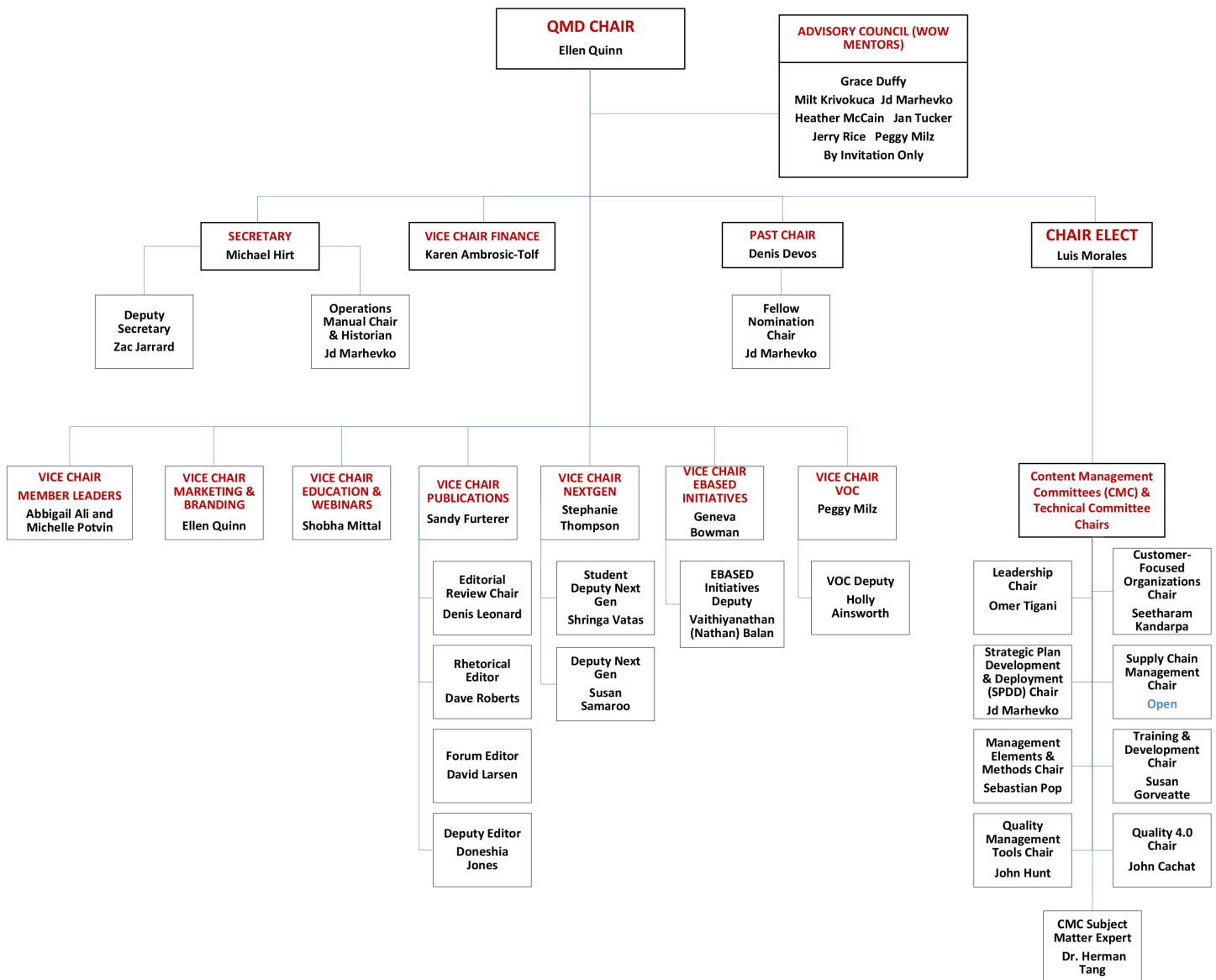
The real testament to a system's success is its impact on streamlining operations and enriching decision-making processes. What once was a tedious, hours-long task of compiling spend data on spreadsheets can now be achieved in mere seconds, freeing up time for more strategic thinking. Moreover, equipping executives with real-time insights shifts the organizational mindset from reactive to proactive, fundamentally changing how decisions are made.

Implementing a successful system goes beyond the nuts and bolts of technology—it demands a vision. It starts with pinpointing the key performance indicators that matter most and designing tools that illuminate these critical areas. Strong leadership and a clear vision for a data-driven culture are essential. Identifying metrics such as cost savings, supplier lead times, and contract compliance, and crafting systems that not only highlight these areas but also cultivate a culture that values data-driven insights is paramount.

## In Conclusion

Dashboard development allows organizations to focus on the vital metrics that drive performance. Teams can quickly view dashboards that are upstream or downstream (wherever helpful) and evaluate strategic and tactical decisions. They enable businesses to make precise, informed decisions, steering operations and strategies with newfound clarity and confidence. In an era where data can and should drive decisions, dashboards are the compass that guides the effective leader.

# The Quality Management Forum





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