Quality issues are on the rise in the automotive, industrial goods, and complex consumer goods industries, but companies need more than standard approaches to address them.
Quality Management Challenges

The quality level in the automotive, industrial goods, and complex consumer goods industries has deteriorated significantly in recent years, as companies respond to pressures ranging from the increase in software components within products to more complex value chains and shortened time-to-market. This decline has placed quality management solidly back on the executive agenda, yet according to our research, standard quality management practices have lost their effectiveness. To fully address quality management today, companies must not only adjust standard quality methods that might have slipped as they grapple with various challenges, but also apply innovative new quality management approaches. We refer to this as Quality 4.0.

There are a number of reasons quality issues are on the rise in the industries noted above. First, the share of electronics and software within products is steadily increasing, contributing significantly to product complexity. In the automotive industry, for instance, electronics and software now constitute up to 40 percent of the cost of a vehicle. In addition, global manufacturing and supply chains put an additional strain on quality because companies need to be able to secure the same standards everywhere they operate, regardless of distance and local sourcing. Finally, product variety has increased, and product cycles have shortened significantly. For example, the manufacturing businesses participating in A.T. Kearney’s Factory of the Year Competition report that on average, time-to-market has dropped by 12 percent over a three-year time span. This means companies need to handle multiple product development projects simultaneously, all while meeting both regulatory and customer requirements in a growing number of markets.

As quality issues increase, we estimate the associated costs will rise by 30 percent if companies do not take countermeasures. For the top 100 global companies from the automotive, industrial goods, and complex consumer goods industries, this would mean a negative operating profit impact of $215 billion. In the worst case, as recent examples of automotive suppliers and consumer electronics manufacturers demonstrate, quality issues can threaten a company’s existence.

The Quality Management Opportunity

While technological change has thrown a wrench into quality management, it also offers companies an opportunity to both redefine quality and become quality champions in new fields. In many industries, quality standards have remained unchanged, and the same established companies have retained their position as quality leaders. But the environment is changing, and new standards and customer requirements are emerging. One need look no further than autonomous and electric vehicles in the automotive industry or the Internet of Things in the industrials sector. This new landscape is leveling the playing field, offering all companies an opportunity to become the new quality champions in their respective industries. Innovative quality methods such as real-time community feedback, big data, or predictive quality management enable next-level quality performance.

To shed light on today’s quality management challenges and help companies prepare for the future, A.T. Kearney launched its Quality 4.0 initiative, which aims to provide executives with a basis for quality agendas that will be effective and relevant in 2025. We gathered insights from more than 20 quality management engagements, conducted proprietary analyses, and
examined best practices used by our clients globally across industries. In addition, we conducted a global survey of more than 50 executives and experts.

The results show that companies are primarily grappling with two issues: maintaining their quality foundation in light of new challenges, and applying innovative quality management methods. Companies’ failure to sustain a solid quality foundation is especially alarming. Those that have developed quality management proficiency over the long term using the traditional approaches of quality management systems, stage-gate processes, and key performance indicators (KPIs) are awakening to the new reality described above. Four out of 10 executives feel that standard quality methods are becoming less effective, and nearly half (48 percent) have observed an increase in quality issues over the past 10 years. Half of them (50 percent) say they expect quality issues to increase over the next 10 years as well (see figure 1).

Figure 1
The decreasing effectiveness of standard quality management practices

<table>
<thead>
<tr>
<th>% of respondents who...</th>
<th>Over the past 10 years</th>
<th>In the next 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>...experienced decreasing effectiveness of standard quality methods</td>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>...believe customer-relevant quality issues increased or will increase</td>
<td>48%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Source: A.T. Kearney analysis

When asked to evaluate the impact various trends have on their company’s quality management, executives ranked shortened time-to-market first, with 68 percent saying it posed a major challenge. Other important factors included growing product complexity (58 percent), increasing globalization (54 percent), and a rise in regulatory changes (54 percent).

To address these challenges, companies need to improve in three areas: preventive quality, reactive quality, and quality governance and culture (see figure 2 on page 3).

Preventive quality management

Quality is not just about the manufacturing process. To reach the highest level, it must be designed into products themselves. “Preventive quality management” is a process designed to ensure a product’s quality during development and industrialization. It extends quality management beyond the shop floor, where it has been stuck for many years. For example, 82 percent of respondents state that their company places major emphasis on production quality; in contrast,
Figure 2
Three areas are crucial to solid foundation

- Concept maturity
  - Voice of customer orientation
  - Clear specification
  - Targeted DFSS
  - High prototype quality
  - Efficient validation
  - WW standards
  - Stringent Q-gates

- Supplier quality
  - Stringent supplier assessment
  - Supplier quality improvement
  - Efficient supplier audits

- Production quality
  - Strong simultaneous engineering
  - Launch management
  - High process capability
  - Efficient 0-km failure elimination process
  - WW standards

- Repair and service
  - Strong diagnostic capability
  - Repair time reduction
  - Increased “fixed first visit”
  - Decreased “no trouble found”

- Failure elimination process
  - Fast failure detection and prioritization
  - Efficient field failure elimination process

- Continuous improvement
  - Consequent input for new product projects

# of print deviations
<table>
<thead>
<tr>
<th>Concept maturity</th>
<th>Supplier quality</th>
<th>Production quality</th>
<th>Repair and service</th>
<th>Failure elimination process</th>
<th>Continuous improvement</th>
</tr>
</thead>
</table>

Quality governance and culture

- Holistic quality strategy
- Strong quality organization and governance
- Stringent quality performance management
- Quality culture

Customer satisfaction

- Preventive quality levers
- Reactive quality levers
- Quality governance and culture levers
- KPIs

Note: VoC is voice of customer, DFSS is Design for Six Sigma, WW is worldwide, ppm is parts per million.
Source: A.T. Kearney analysis

only 48 percent say that concept definition is within the focus of quality management (see figure 3). Yet concept failures have a direct impact on customer satisfaction.

To counter development deficiencies, quality management needs to start considerably earlier in the value chain. Specifically, it should incorporate an improved understanding of the “voice of the customer” (for instance, via product clinics or reflected in product specification), sophisticated validation methods (using such methods as reliability testing, system design verification plans, and digital mock-ups), and consequent maturity-level control (for example, using quality gates for predevelopment or customer-oriented tests).

Figure 3
Strong production and procurement are the focus of quality management

Executives who believe their company’s quality management is focusing on function (% of respondents)

- Production or manufacturing: 82%
- Procurement or supply chain: 62%
- Concept definition: 48%

Source: A.T. Kearney analysis
**Reactive quality management**

Quality management does not stop with delivery—it also needs to extend to products in the field. "Reactive quality management" includes repair and service, failure elimination processes, and continuous improvement.

Nearly a quarter (24 percent) of survey respondents say service quality is where most quality issues reside in their organization. To improve it, companies need to react fast and sustainably correct defects in the field. KPIs such as failure elimination time (time elapsed from first occurrence of a defect in the field to final elimination in production or at suppliers) need to become fundamental control parameters. Technical innovations such as early warning systems, radio-frequency identification (RFID) tracing, and data analytics for root cause analysis can improve transparency and optimize processes. In addition, companies need to communicate new or uncommon product functions in an easily understandable manner. Studies show that a thorough explanation of product features can increase customers’ perception of quality and overcome usability flaws. Therefore, careful and clear communication can help reduce quality issues after the product is on the market.

**Quality governance and culture**

Quality is not just the purview of a designated “head of quality.” To be effective it must be a joint executive leadership responsibility. Getting the quality foundation right depends on quality governance and culture, including strategy, mindset, performance management, and organization. The scope of authority for quality management plays an important role here. For example, nearly 60 percent of our survey participants indicate that the head of quality management in their company reports to a functional department or board member—in most cases to manufacturing or production, where quality management has traditionally been located (see figure 4).

While such a structure has worked well in the past, companies may need to rethink this arrangement because quality has emerged as an important responsibility for the entire corporation—and for the entire leadership team—rather than for a single department. Some companies have already started making changes: in about a third of the companies surveyed, the head of quality has a direct reporting line to the CEO. Other means can support spreading quality management practices across the organization, including establishing quality KPIs for all functional areas and instituting veto authority for quality managers at critical decision points.

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**Figure 4**

**Quality management typically reports to functional departments**

**Reporting line of head of quality management**

(% of respondents)

<table>
<thead>
<tr>
<th>Reporting Line</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct report to CEO</td>
<td>36%</td>
</tr>
<tr>
<td>Production or manufacturing</td>
<td>34%</td>
</tr>
<tr>
<td>R&amp;D or engineering</td>
<td>10%</td>
</tr>
<tr>
<td>Procurement or supply chain</td>
<td>8%</td>
</tr>
<tr>
<td>Sales, aftersales, or service</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>8%</td>
</tr>
</tbody>
</table>

Source: A.T. Kearney analysis
Creating Innovative Approaches to Quality Management

Companies that have established a solid quality foundation can improve even beyond this level using the many new technologies and methods at their disposal. Data analytics, industry 4.0 applications such as automation and cloud computing, and new forms of customer interaction can take quality management to the next level. However, our study results show that there is still much to be done. Nearly half of respondents perceive their company as not very innovative in quality management, and more than three-quarters (76 percent) see the need to introduce innovative quality methods such as big data, social networks, and industry 4.0 technologies.

Over the course of numerous client projects, we have experienced the positive effects of several innovative quality management methods firsthand. In order to better understand how industry leaders perceive the benefit of these approaches, we asked executives to rate each method. Interestingly, the methods with the biggest expected benefits tend to be lower in adoption (see figure 5).

Figure 5
There is a significant backlog in innovative quality methods

<table>
<thead>
<tr>
<th>Key quality management innovations</th>
<th>Expected benefit vs. adoption rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-time community feedback</td>
<td>Systematic evaluation of online customer feedback as early indicator for acute quality issues and as indicator for future targets</td>
</tr>
<tr>
<td>Remote diagnosis and maintenance</td>
<td>Remote diagnosis and maintenance of quality issues in the field to increase quality of service and reduce costs</td>
</tr>
<tr>
<td>Systems engineering 2.0</td>
<td>Definition and validation of entire systems per customer function consisting of hardware, software, and datasets to increase systems quality</td>
</tr>
<tr>
<td>Quality big data</td>
<td>Systematic analysis of quality sensors/cross-functional data as a basis for preventive quality actions</td>
</tr>
<tr>
<td>Quality prediction</td>
<td>Use of historic durability and reliability data as well as damage parameters to review and adapt test plans in order to predict future performance and warranty costs</td>
</tr>
<tr>
<td>Advanced supply chain quality management</td>
<td>Virtual connection of various sources of supplier quality performance data along the value chain to identify and predict issues</td>
</tr>
<tr>
<td>Quality at industry 4.0</td>
<td>Deep integration of quality management methods and processes, such as quality risk analysis and validation, and innovations in production</td>
</tr>
</tbody>
</table>

Source: A.T. Kearney analysis

Share of survey respondents believing in high benefit of innovation | Share of companies applying method
Real-time community feedback

Rated beneficial by 88 percent of respondents; only 32 percent apply it in their companies.

Companies today can leverage real-time community feedback to detect quality issues because they now have access to a range of web analytics solutions that sift through and draw insights from unstructured customer feedback. These solutions create a “social media radar” that identifies fields of action based on sentiment analysis, as well as meaningful patterns across markets. For instance, root cause analysis can be accelerated if similar external conditions (such as climate) or market specifics (for example, use patterns) are correlated with a certain type of failure. Best-in-class companies employ a cross-functional “rapid response team” to quickly develop customer solutions for quality issues that have been identified in this manner. They can then use their social media channels to communicate to both current and prospective customers that the problem has been solved.

Remote diagnosis and maintenance

Rated an effective quality management method by 86 percent of executives; only 28 percent use it.

Remote diagnosis techniques use sensors to conduct a root cause analysis and can also combine sensor feedback from several devices to create “swarm intelligence.” Some leading companies even use predictive diagnostic solutions to monitor vehicle or machinery conditions and search for correlation patterns that then predict upcoming malfunctions.

While remote maintenance is limited to software or dataset patching, software problems are often responsible for more than 50 percent of service visits in many vehicles. Remote solutions can greatly improve service quality, particularly when they can be used to resolve issues before the customer notices anything is amiss. They can also reduce quality costs because they allow for remote repair versus expensive recalls. A byproduct of all the information-gathering is a wealth of insights for product development and engineering.

Commercial vehicle and aerospace manufacturers are frontrunners in remote diagnosis (for example, engine health monitoring) because downtimes are expensive and security is key. Remote diagnosis is also increasingly used in the industrial sector to monitor machine conditions online, conduct preventive maintenance over the air, and dispatch service personnel if necessary.

Advanced supply chain quality management

Rated beneficial by 76 percent of respondents; only 42 percent of companies use this approach.

In advanced supply chain quality management, predictions are made based on supplier performance records and past incident data, so it is crucial to aggregate key data sources, including supplier performance indicators at audits and incident data on a plant and network level. For critical suppliers, real-time data exchange can be a powerful tool, particularly for item-level RFID data. Intelligent algorithms constantly analyze the data using empirical methods as well as case-based reasoning. The information is aggregated to create a score that indicates the likelihood of future quality incidents. A poor score triggers a 100-day “get fit” program to immediately address current issues and eliminate root causes at the supplier.
Lay the Groundwork Now

A.T. Kearney offers a proven approach for increasing the effectiveness of standard quality management methods and then applying quality innovations with the greatest benefit for the individual corporation (see figure 6).

Figure 6
A.T. Kearney’s approach to reaching the next level in quality management

1. Get quality foundation right again (if necessary)
   - Check “quality foundation”:
     - Map company’s quality management standards against >100 best practices (written form)
     - Assess application in current or recent reference projects (practice)
   - Results:
     - Individual gaps identified
     - Improvement measures defined

2. Invest in appropriate quality innovations
   - Prioritize Quality 4.0 areas according to individual needs:
     - Identify company’s key quality issues along the value chain
     - Match key issues to a repository of innovative quality methods
   - Pilot most suitable innovations
   - Results:
     - Quality management innovations in place

Source: A.T. Kearney analysis

The first step in this process is to conduct a “quality foundation check” to identify gaps in your quality foundation. Mapping a company’s quality management standards both in written and in applied form (in other words, analyzing actual development or reference projects) against more than 100 best practices makes key areas for improvement visible.

New technologies will continue to trigger new quality standards to be mastered by the next generation of quality leaders.

Secondly, you can future-proof your quality management capabilities with the help of innovative quality management methods prioritized according to your company’s individual needs. This entails identifying key quality issues along the value chain and matching them to a repository of innovative quality methods such as reliability testing, advanced supply chain quality management, and industry 4.0 applications.

Ineffective and outdated quality management can erode a company’s revenue and profit—one reason quality management should be among the top items on the executive agenda. Moreover, new technologies will continue to trigger new quality standards that will need to be mastered by the next generation of quality leaders. The time for laying the groundwork for a preventive, holistic, and future-proof quality management is now.
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About Factory of the Year

“Factory of the Year — Global Excellence” in Operations is an annual benchmark competition organized jointly by A.T. Kearney and the business journal Produktion. With more than 100 KPIs in six dimensions of the operations environment, the competition is recognized as the most rigorous benchmarking test for companies in the production arena. Since its launch in 1992 more than 2,000 factories have participated.
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