

**A Report Prepared for Toyota Motor Corporation**

**Findings by Independent Experts**  
*about*  
**Quality Assurance at Toyota**

June 30, 2010

**Union of Japanese Scientists and Engineers**

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**A Report of the Findings by Independent Experts  
about Quality Assurance at Your Company**

**We at the** Union of Japanese Scientists and Engineers received a request from your Quality Division on March 12, 2010, to evaluate your quality assurance framework. You requested us, as a third-party organization, to assemble independent experts to conduct the evaluation from an objective standpoint. The evaluation would cover the organizational and process improvements that you had made in the wake of a series of product recalls.

In response to your request, we assembled a panel of the four experts named below. Heading the panel was Hiroshi Osada, a professor at the Tokyo Institute of Technology. The panel received presentations from Toyota representatives on April 26 and May 17, 2010, and conducted its evaluation based on those presentations.

Attached is a report that comprises a summary of the panel's findings and a detailed description of the findings by category. I sincerely hope that this report will prove useful to you at Toyota in your quality assurance activities.

Expert	Affiliation	Qualification
Hiroshi Osada	Professor Graduate School of Innovation Management Tokyo Institute of Technology	Experts in quality control
Noriaki Kano	Professor Emeritus Tokyo University of Science	
Yasuo Kusakabe	Chairman Automobile Journalist Association of Japan	Prominent automotive journalist
Yoshiko Miura	General Manager, Public Relations Division, Japan Consumers' Association	Consumer spokesperson

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## Summary

This report presents the findings of our evaluation of measures at Toyota Motor Corporation (“Toyota”) for improving quality assurance and related communications activities. It comprises our evaluation of measures described in presentations by company representatives at the company’s Toyota City headquarters on April 26 and May 17, 2010. The presentations were by managers from pertinent divisions and described measures for preventing the recurrence of the kinds of quality issues that occurred at Toyota from late 2009 to March 2010. Those problems included floor mat interference with accelerator pedals, accelerator pedals that were slow to return to their non-depressed position, and a defect in the Prius braking system (ABS software program). Our evaluation encompassed proposed measures for improving internal and external communications in regard to product quality, as well as measures for preventing quality lapses.

### **1. Measures for preventing the recurrence of quality issues**

We evaluated Toyota’s proposed measures for quality-related improvements in the work processes in the sequence from field-information gathering to recall decision-making, in after-sales service, in purchasing, and in product development. Measures are under way in the pertinent divisions at Toyota, we found, to improve quality assurance from a customer perspective. The measures described for us are convincing, and they promise to yield solid results if implemented as described.

Below is a list of measures described by Toyota representatives that we found especially promising.

- Upgraded capabilities for gathering and analyzing customer-relationship information at overseas operations and for gleaning useful information from customer complaints submitted to the U.S. National Highway Traffic Safety Administration (NHTSA)
- Expanded and upgraded networks of technical offices to respond more quickly in conducting onsite investigations of reports of serious quality issues (Toyota’s so-called SMART activities, an acronym for Swift Market Analysis and Response Team)
- Unified design responsibility for crucial components, such as accelerator pedals, in single divisions (instead of spreading that responsibility across multiple divisions, as occurred formerly) and establishing an autonomous division to spearhead improvements in design quality, including measures for reflecting customer input in design standards
- Customer First training centers established at five sites worldwide to cultivate quality assurance professionals and to ensure the retention of pertinent skills and technology across generations

Meanwhile, we request further improvements in the following respects in the future.

- Analyzing each serious accident and each serious customer complaint thoroughly and translating the analytical findings into concrete measures for preventing the recurrence of the problems in question and for preventing the occurrence of similar problems
- Collaboration between Toyota's quality-related divisions and its Legal Division: employ information from the Legal Division in combination with customer-relationship information and NHTSA's customer-complaints information in analyzing accidents
- Developing and applying criteria for gauging the attainment of trainees at the Customer First training centers
- Deploying even more field personnel than Toyota's present plans call for and providing training to equip the field personnel to function effectively from a customer perspective
- Developing and applying criteria for evaluating suppliers in regard to management expertise and implicit risk, as well as technical capabilities
- Supplementing Toyota's measures for obtaining input from third-party experts in so-called "design reviews based on failure mode" with measures for securing input from the company's after-sales service people, who deal directly with customers; adopting measures to upgrade the management of design revisions from the standpoint of preventing quality issues
- Stepping up training for dealers' maintenance and repair personnel to prevent problems; for example, floor mat interference with accelerator pedals

## **2. Measures for ensuring effective internal and external communication when serious quality issues have occurred**

Toyota representatives described for us measures for improving the company's crisis-management communication, both internal and external. Those measures are notably promising in regard to:

- stepping up communication with the mass media and with other external audiences
- mobilizing task forces under the leadership of executive vice presidents
- establishing the BR (Business Reform) Communication Kaizen Department to spearhead improvements in communication, and
- setting up the Special Committee for Global Quality and strengthening regional operations' capabilities and authority for responding promptly to quality concerns.

However, ensuring lasting improvements in crisis-management communication will depend on accompanying the measures with workplace procedures and mechanisms for fulfilling their goals. Especially pressing is the need for establishing guidelines to steer crisis-management activity by the president and other members of senior management and for monitoring the effectiveness of those guidelines on a continuing basis. Also pressing is the need for bridging the culture gap between Japan and other nations in public relations activities and for strengthening Toyota's locally based capabilities for handling media relations in each principal region.

## **Full Report**

### **By Category**

#### **1. Issues in the Sequence from Field Information Gathering to Recall Decision Making and Measures for Addressing those Issues**

##### 1-1. Gathering and analyzing quality-related information from overseas operations

###### *1-1-1. Issues targeted by Toyota for improvement*

Toyota has previously failed to gather enough information from its U.S. call centers, from NHTSA, and from dealers. That has slowed the company's confirmation of serious quality issues.

Legal responsibility for fatal accidents is, to be sure, something for the courts to decide. But even verdicts favorable to Toyota do not necessarily absolve the company of responsibility in regard to quality assurance. Toyota needs to take seriously any accident that claims the life of a driver or any other individual. The company should have responded more proactively to accidents involving fatalities, even those accidents attributed to driver error or to other human error. It should have worked from the perspective of product-liability prevention to eliminate or at least minimize accidents.

Several factors dissuaded Toyota's quality assurance organization from acting more proactively. Below are the three factors that apparently were influential.

- Accident data includes personal information, which entails the need for observing guidelines for confidentiality.
- Accident data possessed by Toyota could affect the course of litigation.
- The discovery of a defect in a vehicle would imply the existence of the same defect in other vehicles, and that could occasion a surge of complaints and necessitate a technical response.

###### *1-1-2. Toyota's proposed countermeasures*

- Upgrade pertinent information management by gleaning information about accidents and other important issues from customers and from the authorities, inputting that information into an integrated quality information system maintained at Toyota headquarters by the Customer Quality Engineering Division, and conducting analyses of that data together with continuing analyses of technical data.
- Make the integrated quality information system accessible to all pertinent divisions in Japan and overseas.
- Inaugurate SMART activities to conduct prompt, onsite investigations when serious quality issues have arisen.

###### *1-1-3. Foreseeable benefits of the countermeasures*

Toyota's capabilities for gathering and analyzing accident data are likely to benefit from (1) the planned building of a system for gleaning pertinent information from U.S. call centers, from NHTSA, and from dealers and (2) the planned adoption of networked communications in handling customer quality information. The onsite investigations through SMART activities, meanwhile, promise to provide Toyota with faster access to valuable information.

#### *1-1-4. Issues that require further attention*

- a. On the occurrence of serious accidents and complaints of the kinds seen recently, Toyota needs to move more forthrightly in analyzing the problems, in determining the fundamental causes of the problems, and in taking effective countermeasures.
- b. Toyota's Legal Division needs to refrain from holding an overly legalistic mindset and share crucial information promptly and in good faith with quality-related divisions.
- c. Toyota needs to gauge the effectiveness of its measures for responding to serious problems, such as accidents involving fatalities. That should include monitoring the frequency of similar accidents and complaints. Managing the processing of customer complaints is a crucial sector of quality assurance, and monitoring the pattern of complaints about a problem after receiving the initial complaint about the problem is especially important. Analyzing complaints in reference to the following three categories will illuminate the effectiveness of measures for addressing problems.

- *Complaints about vehicles sold before receiving the initial complaint*

When the complaints arise before the completion of countermeasures for resolving the problem, alerting vehicle owners to the problem through the mass media and through other channels can reduce the incidence of complaints. A recall should, of course, forestall the occurrence of complaints after the completion of countermeasures.

- *Complaints about vehicles sold after receiving the initial complaint but before completing the countermeasures for resolving the problem*

Suspending sales temporarily after submitting to the authorities an official notification of a serious quality issue can reduce the incidence of complaints. Again, a recall should forestall the occurrence of complaints after the completion of countermeasures.

- *Complaints received about vehicles sold after completing the countermeasures for resolving the problem*

These kind of complaints indicate, of course, that vehicles, on which the countermeasures had not be implemented, were shipped or that the countermeasures were inadequate.

#### 1-2. Gleaning information from customer complaints submitted to the U.S. National Highway Traffic Safety Administration

##### *1-2-1. Issues targeted by Toyota for improvement*

Toyota should have paid daily attention to the customer complaints received by NHTSA. To be sure, parsing NHTSA's online consumer-complaint database can be difficult. Sometimes, the postings from consumers lack specificity. Vehicle owners, meanwhile, sometimes bypass their dealers in submitting complaints to NHTSA, which complicates the task of corroboration.

There is information, however, on the NHTSA database that is sufficiently concrete, and that makes it well worth monitoring. Devoting more attention to postings presumably would have alerted people at Toyota earlier to the severity of the recent quality issues. Toyota needs to use that information to supplement the information obtained through proprietary channels, such as field technical reports, customer complaints, and responses to complaints. That should include collating the information by kind of accident and by the location of defects in vehicles.

#### *1-2-2. Toyota's proposed countermeasures*

- Collect postings of customer complaints from the NHTSA online database, input them into the integrated quality information system maintained at Toyota headquarters by the Customer Quality Engineering Division, and manage and analyze them together with the technical information in the system.
- Make the integrated quality information system accessible to all pertinent divisions in Japan and overseas.
- Undertake analytical text mining of the NHTSA consumer-complaints database to identify possible trends and to gain other useful insights.

#### *1-2-3. Foreseeable benefits of the countermeasures*

Collecting information from the NHTSA database and managing that information in the Customer Quality Engineering Division's integrated quality information system promise to yield valuable insights into accidents and customer complaints. Making the integrated quality information system accessible to pertinent divisions in Japan and overseas will further increase the analytical value of the information from the NHTSA database.

#### *1-2-4. Issues that require further attention*

Toyota expects text mining of the NHTSA database to yield valuable insights into accidents and customer complaints. The company, however, needs to avoid relying excessively on that approach. The text mining needs to be part of a larger approach centered on onsite investigations linked to prompt responsiveness. That approach should include securing information from police departments about accidents and from fire departments about vehicular fires.

### 1-3. Cultivating human resources at overseas operations

### *1-3-1. Issues targeted by Toyota for improvement*

Responsibility for analyzing quality issues at Toyota has been centered at the company's headquarters in Japan. That is because Toyota's headquarters possesses more thorough capabilities for the requisite analytical work than the company's overseas operations possess.

### *1-3-2. Toyota's proposed countermeasures*

Toyota is establishing Customer First training centers in Japan, China, Europe, Southeast Asia, and North America. Its stated goals for those centers are to foster quality assurance professionals and to cultivate future leaders for Toyota operations around the world.

### *1-3-3. Foreseeable benefits of the countermeasures*

The Customer First training centers have an extremely important function to fulfill in cultivating human resources in support of upgraded quality assurance. Their quality assurance training, if conducted as described, warrants high regard.

### *1-3-4. Issues that require further attention*

Toyota needs to undertake companywide skill mapping for quality assurance-related skills, and it needs to adopt effective measures for evaluating employee skills in quality assurance and for motivating employees to hone and apply those skills. In-house trainers will fulfill an indispensable role in that regard, and Toyota needs to deploy highly qualified experts to educate and supervise the trainers.

## **2. Issues in After Sales Service and Measures for Addressing those Issues**

## 2-1. Upgrading overseas field personnel qualitatively and quantitatively

### *2-1-1. Issues targeted by Toyota for improvement*

The number of Toyota field personnel in overseas markets has grown little despite rapid growth in the company's sales volume. In addition, training for those personnel has been generally inadequate, and that has undermined Toyota's capacity for information gathering in overseas markets.

### *2-1-2. Toyota's proposed countermeasures*

- Dispatch veteran field personnel from Japan to overseas markets to help deal with problems there and to train locally hired field personnel.
- Increase the number of field personnel from 18 to 24 and increase the frequency of site visits from 224 a year to 335 a year.

### *2-1-3. Foreseeable benefits of the countermeasures*

The increase in the number of field personnel and the dispatching of veteran field personnel from Japan promise to bolster Toyota's capabilities for securing useful information in overseas markets.

### *2-1-4. Issues that require further attention*

Even after the planned increase, the number of field personnel will be insufficient. The field personnel will need to leverage their capabilities through cooperation with the service and sales personnel at Toyota's national distributors and with their counterparts at the dealers. Toyota also needs to devote increased attention to providing the field personnel with ample training, education, and motivation and to conducting fair and transparent evaluations of their performance. It needs to improve communication with the locally hired field personnel to develop a shared awareness of the customer perspective.

## 2-2. Initial investigation of individual incidents

### *2-2-1. Issues targeted by Toyota for improvement*

Toyota has lacked sufficient capacity for conducting onsite investigations promptly after the suspected occurrence of serious quality issues. It has also lacked adequate capacity for follow-up information gathering.

#### *2-2-2. Toyota's proposed countermeasures*

Inaugurate SMART activities to conduct onsite investigations immediately after receiving reports of serious quality issues and to identify the causes of the problems. "Serious quality issues" refers mainly to fundamental problems with the powertrain, steering, or braking functions.

#### *2-2-3. Foreseeable benefits of the countermeasures*

The information gathered about quality incidents through SMART activities promises to make a large, cumulative contribution toward elucidating quality issues and potential problems.

#### *2-2-4. Issues that require further attention*

Toyota's recent experience in the United States suggests that, in some regions, lawyers should accompany the SMART personnel. In addition, Toyota needs to define clearly the range of SMART responsibilities and authority for dealing with vehicle defects.

### **3. Issues in Purchasing and Measures for Addressing those Issues**

#### 3-1. Improvements in the ordering and development processes

##### *3-1-1. Issues targeted by Toyota for improvement*

Toyota lacks a clear definition of what constitutes an "important functional component," and it failed to devote sufficient priority in quality management to the accelerator pedal that occasioned a massive recall. Meanwhile, information sharing between Toyota's purchasing and engineering operations is insufficient. The engineering operations monopolize crucial technical information, leaving the purchasing operations with an inadequate technical basis for selecting suppliers.

##### *3-1-2. Toyota's proposed countermeasures*

- Articulate a clear definition for important functional components and devote priority to those components in quality management.
- Provide the purchasing operations with expertise and information in regard to important functional components to equip those operations to judge suppliers' technical capabilities accurately in awarding purchasing contracts.

##### *3-1-3. Foreseeable benefits of the countermeasures*

Clarifying what constitutes an important functional component is a positive step in bolstering

quality management. Toyota's quality management also stands to benefit from the planned improvement in liaison between the company's engineering and purchasing operations. Quality is likely to improve as the purchasing operations acquire the capacity for evaluating suppliers' design quality, as well as their manufacturing quality, and for establishing pertinent standards.

#### *3-1-4. Issues that require further attention*

- a. Toyota must ensure that information sharing between the engineering and purchasing operations is comprehensive rather than concentrated in one place. Toyota needs to put in place mechanisms to provide the engineering operations and the purchasing operations with integrated, reciprocal access to information possessed by either. That should include building a database of information about suppliers and outsourced components easily accessible by the engineering operations, as well as by the purchasing operations. Quality and cost will command mounting emphasis in purchasing decisions, but safety needs to receive even-greater emphasis. And Toyota's engineering and purchasing operations should use their integrated information sharing to fulfill that emphasis.
- b. Developing global criteria for evaluating suppliers and their products should include developing criteria for evaluating management expertise and implicit risk, as well as technical capabilities.
- c. Toyota should work with third-party adjudicators of technical quality, such as Germany's technical inspection associations, in evaluating suppliers and their products. The company and the cooperating third parties would disclose the results of the evaluations, and the quality guarantees earned by the suppliers could become objective criteria in allocating purchasing contracts.
- d. The presentation that we received about planned improvements in the supplier selection and in the purchasing-related elements of product development left some doubts. It left unclear, for example, what kinds of quality management problems underlay the defective accelerator pedal components outsourced to CTS Corporation. Toyota needs to be more probing in its search for root causes and in its measures for preventing the recurrence of quality issues.

### **4. Issues in Product Development and Measures for Addressing those Issues**

#### 4-1. Feedback mechanisms for nurturing a customer perspective in development

##### *4-1-1. Issues targeted by Toyota for improvement*

- The problem with the Prius braking system (ABS software program) was an instance of failing to adopt a customer perspective in engineering. A modification intended to improve vehicle performance instead ended up causing unease for customers. Japan presents limited opportunities to conduct vehicle testing on public roads, but Toyota could have been more

thorough in verifying basic performance from a customer perspective in regard to steering and braking. A similar lapse was apparent in the problem with the variable gear ratio steering system in the Lexus LS model series.

- Toyota's engineering operations in Japan and the company's overseas operations have not been sufficiently sharing information with each other. Part of the problem is that customer complaints received by overseas dealers and by overseas operations have not been sufficiently collated. And then there was inadequate sharing of information regarding customer sentiment in overseas markets between the Japan-based engineering operations and overseas operations.
- The accidents caused by floor mats have highlighted the need for anticipating a vast range of potentially different usage by customers. Globalization means that Toyota vehicles are used in ways that might be all but inconceivable in Japan. The company therefore needs to address in product design, development, and evaluation a full spectrum of possible use. That is an important phase of approaching vehicle development from a customer perspective. Toyota should have been more rigorous in studying how people actually use its products and in devising ways to prevent issues from arising.

#### *4-1-2. Toyota's proposed countermeasures*

- Consolidate the design responsibilities for important functional components, including accelerator pedals, in single organizational units. Use that consolidation to accumulate and propagate valuable information gleaned from previous development projects and from field experience with defects.
- Work through the newly established Design Quality Innovation Division to secure customer input, monitor changes in the vehicle-operating environment, and gather information about moves by competitors and to spearhead activities for incorporating findings promptly in design standards. That will include working closely with the design development divisions and with the engineering management divisions.
- Establish a product-auditing department to audit products from the standpoint of how they might be used by customers and to translate its findings into product-evaluation methodologies.

#### *4-1-3. Foreseeable benefits of the countermeasures*

Toyota's proposed countermeasures promise to ensure a more customer-oriented approach in product development and evaluation. Consolidating the design responsibilities for important functional components, such as accelerator pedals, in single organizational units is a promising organizational reform. The establishment of the Design Quality Innovation Division, too, is a positive step. That division's neutral stance will position it well to coordinate design quality with the design and development divisions. Also promising is the planned establishment of a product-auditing department. Input through that department about real-world usage of Toyota products will help the company anticipate different kinds of use and tailor its product designs appropriately.

#### *4-1-4. Issues that require further attention*

- a. The Design Quality Innovation Division will presumably resolve some long-standing issues in product development, but good communication with the design and development divisions and with the engineering management organization will be crucial. Toyota needs to take steps to ensure that the communication is as good as it needs to be.
- b. Detecting signs of possible problems promptly and from a customer perspective will require close communication between the design and development divisions and the product-testing divisions. This is another item where Toyota needs to be careful to ensure open and effective communication. In a related consideration, Toyota might benefit from securing consumer participation in behind-the-wheel product evaluations.
- c. The establishment of a product-auditing department offers the potential for speeding Toyota's response to ways that people are using its products. Fulfilling that potential, however, will depend on building extensive information networks for securing the requisite input. Toyota needs to provide the department with sufficient access to real-world input to act with a full measure of initiative. The company also needs to ensure a common perspective in acting on the department's findings. Differing points of departure in addressing technical-capability issues and customer-service issues will negate the value of organizational and procedural improvements, and problems will recur.
- d. Toyota needs to be more rigorous in examining possible underlying problems in accidents attributed to driver error or to other kinds of mishandling. It needs to adopt a customer perspective in investigating why people make the mistakes in question. Even if the number of relevant accidents is small, any recurring phenomena warrant careful investigation. Toyota needs to determine why the driver error or other mishandling occurred, and it needs to investigate whether anything about the product design is conducive to such behavior.

#### *4-2. Long-term quality monitoring*

##### *4-2-1. Issues targeted by Toyota for improvement*

Quality issues are arising in vehicles that have been on the road for a while. Toyota has not been rigorous enough in monitoring quality performance in the field after completing development work and putting models into mass production.

##### *4-2-2. Toyota's proposed countermeasures*

Work through the Design Quality Innovation Division to

- identify problems that occur over time in products that are free of overt defects and
- secure the participation of experts in developing general solutions for preventing the recurrence of problems.

#### *4-2-3. Foreseeable benefits of the countermeasures*

Monitoring changes over time in vehicles free of overt defects could yield valuable information for long-term quality assurance. Also promising is Toyota's stance in looking beyond case-specific solutions and eyeing general solutions for any problems found.

#### *4-2-4. Issues that require further attention*

Toyota needs to avoid relying overly on the judgment of engineers in developing general solutions. It needs to make sure that any solutions proposed really do transcend isolated incidents of quality issues and that they provide a general resolution of the problem in question from a customer perspective.

### 4-3. Ensuring the cross-generation transmission of technical information

#### *4-3-1. Issues targeted by Toyota for improvement*

In some cases, the chief engineers in charge of vehicle-development projects are not veterans of the previous-generation development projects for the same vehicles. And their project teams do not necessarily inherit all of the know-how and wisdom accumulated in the previous-generation projects.

#### *4-3-2. Toyota's proposed countermeasures*

Select the chief engineers for vehicle-development projects from among the veterans of the previous-generation development projects. Make the most of their experience in managing changes in products based on a solid understanding of what transpired previously.

#### *4-3-3. Foreseeable benefits of the countermeasures*

Toyota's heightened determination to ensure the cross-generation transmission of technical information is a positive development. Even a midstream change in project leadership needn't be disruptive if people honor the defining elements of the development concept. Toyota can achieve the necessary continuity by appointing chief engineers who are veterans of the previous-generation development projects and subleaders who will head the next-generation projects. The momentum of that technical inheritance will carry over into development projects

for individual components, as well as energizing the vehicle-development work.

#### *4-3-4. Issues that require further attention*

Toyota needs to monitor the effectiveness of continuity in project management in terms of the cross-generation transmission of technical information.

### 4-4. Securing material and organizational resources for conducting real-vehicle evaluations

#### *4-4-1. Issues targeted by Toyota for improvement*

Tackling a growing number of development projects has obliged Toyota to rely increasingly on external resources, and the frequency of opportunities for “home-grown” engineers to participate in real-vehicle evaluations has declined. Toyota has suffered a shortage of engineers versed in real-vehicle evaluations, even as the importance of those evaluations has mounted.

#### *4-4-2. Toyota’s proposed countermeasures*

- Secure ample work opportunities for engineers in connection with ensuring safety and quality.
- Use the product-auditing department to audit products from the standpoint of how they might be used by customers, and translate the department’s findings into product-evaluation methodologies.

#### *4-4-3. Foreseeable benefits of the countermeasures*

Toyota’s expressed determination to secure sufficient resources for real-vehicle evaluation work is promising. That determination suggests that the company can avoid letting the quality of development work be undermined by insufficient resources.

#### *4-4-4. Issues that require further attention*

Vehicle evaluations need to transcend evaluations of the constituent components. Toyota needs to ensure that the evaluations, conducted by engineers responsible for different technological sectors, yield comprehensive findings.

### 4-5. Product-development measures for preventing defects

#### *4-5-1. Issues targeted by Toyota for improvement*

- Toyota conducted design reviews based on failure mode in regard to floor mats in the development stage of the models affected. The working assumption in those reviews, however, was that the clips were properly attached. Toyota had affixed a written warning about detached clips. Reliance on the effectiveness of that warning removed from consideration the possibility of an unsecured mat's creeping forward and entrapping the accelerator pedal.
- Toyota was also not rigorous in conducting design reviews based on failure mode in regard to the accelerator pedals. The resultant problem of sticky pedals was a typical instance of failing to grasp the consequences of changes in specifications. Toyota had adopted accelerator pedals that differed in materials and in configuration from those supplied in Japan by Denso Corporation, even though the Denso pedals were problem-free.

#### *4-5-2. Toyota's proposed countermeasures*

- Be more rigorous in conducting design reviews based on failure mode for important functional components, and secure the participation of authorities on the pertinent vehicle components and experts in the pertinent materials in the reviews. Use the reviews to become more sensitive to unresolved technical issues and to thereby help prevent defects.
- Consolidate the design responsibilities for important functional components, including accelerator pedals, in single organizational units. Use that consolidation to accumulate and propagate valuable information gleaned from previous development projects and from field experience with defects.

#### *4-5-3. Foreseeable benefits of the countermeasures*

Securing the participation of diverse experts in the design reviews based on failure mode promises to improve sensitivity in identifying potential problems.

#### *4-5-4. Issues that require further attention*

Our evaluation of Toyota's measures for improving quality assurance covered three serious quality issues: floor mat interference with accelerator pedals, accelerator pedals that were slow to return to their non-depressed position, and a defect in the Prius braking system (ABS software program). Toyota's initial response to all three problems focused too heavily on engineering and not enough on preventing recurrence from the perspective of quality assurance. We urge Toyota to take the following measures in the spirit of preventing similar lapses in quality assurance management.

- Analyze why the problems escaped detection in design reviews based on failure mode.
- Analyze why defective design work passed into mass production despite the Toyota emphasis on building quality checks into processes.
- Analyze how the affected products are being used in the field.

Let us see how the first two of these analyses would play out in Toyota's experience with the floor mats.

a. Analyzing why the problem escaped detection in design reviews based on failure mode

A design review based on failure mode for the driver's side would ordinarily include failure mode and effect analysis. And the question arises as to why that analysis didn't illuminate the danger of the floor mat creeping forward and entrapping the accelerator pedal. That failure begs the question as to whether the items in question were even subject to the analysis.

We learned, as noted, that the working assumption in the design reviews based on failure mode was that the driver-side floor mat was properly secured. The analysis, in other words, did not cover the possibility of an unsecured floor mat. That highlights the importance of having a checklist of items for addressing in the design reviews based on failure mode and for reviewing the checklist to determine its appropriateness. The design reviews impart a formal credibility to designers' assumptions about how products will be used. So, inappropriate checklists present a danger of future lapses in quality assurance.

Further, the fact that no one was able to point out problems with the assumptions, as shown above with the assumptions made about floor mat clips, indicates problems with the selection of participants.

Toyota is rethinking its approach to conducting the design reviews based on failure mode and its approach to selecting participants for the reviews. Important to note here:

- Toyota's design review for the accelerator pedals included no participants with a deep knowledge of the after-sales service sector;
- Nor did the participants include anyone with a practical awareness that vehicle owners frequently use unsecured floor mats and that floor mats of diverse specifications are on the market.

Toyota representatives report that they expected the quality assurance staff to be able to convey the views and understanding of the field personnel at the review. The company's experience underlines the importance, however, of complementing review participants from quality assurance with participants from the service sector.

Yet another concern is the doubt raised about whether the entrapped accelerator asserted functional priority over the brake pedal. Designers have their own notions about the natural way for people to operate vehicles. Toyota needs to secure input in its design reviews based on failure mode from people who do not necessarily share the designers' preconceptions—from people, that is, who can bring a customer perspective to the reviews.

b. Analyzing why defective design work passed into mass production despite the Toyota emphasis on building quality checks into processes

Toyota's design reviews based on failure mode should include analyzing the company's design guidelines for such things as the length of accelerator pedals. That analysis should include, for

example, determining whether the design guidelines addressed the danger of interference from a floor mat. It should also include determining, for instance, whether designers had database access to information about third-party replacement floor mats.

Another issue for Toyota to investigate is the background to the decision to switch to accelerator pedals of a different material. The Denso-manufactured pedals are of polyoxymethylene (POM, polyacetal), whereas the CTS-manufactured pedals are of polyphenylene sulfide (PPS). POM has better wear resistance than PPS, though PPS is tougher. Toyota needs to determine what kind of attention that switch received in the relevant design review based on failure mode. If it finds that the switch received little or no attention, it needs to change the review procedures to prevent similar omissions in the future.

The experience with the floor mat interference and sticky accelerator pedals has important implications for other components. Toyota needs to analyze that experience thoroughly from the standpoint of quality assurance and put in place measures to prevent similar problems.

## **5. Issues in Internal and External Communication in the Wake of the Occurrence of Serious Problems and Measures for Addressing those Issues**

### 5-1. Senior-management participation in initial-response measures

#### *5-1-1. Issues targeted by Toyota for improvement*

Before TMC President Akio Toyoda's press conference in February 2010, Toyota was belatedly trying to cope with adverse events. For example:

- Toyota's U.S. mailing of warnings about the possible danger with floor mats came two months after the Saylor accident (in San Diego) and
- Determining whether the North American problem with CTS-manufactured accelerator pedals matched the European problem took time.

A perusal of the leading newspapers gives the impression that the coverage of Toyota subsided substantially after Toyoda's testimony at a U.S. congressional hearing. That underlines the importance of a visible presidential presence when the company is confronting serious problems.

Sound determinations about when the president should appear in public require continuing access to accurate, up-to-the-minute information about pertinent developments. The evidence suggests that Toyota lacked crisis-management guidelines for providing the president and the executive vice presidents with crucial information, for specifying emergency-response procedure, and for identifying which individuals in which divisions should be in charge of coordinating the company's response.

#### *5-1-2. Toyota's proposed countermeasures*

- Establish the Special Committee for Global quality.
- Inaugurate task force activities under the leadership of an executive vice president to support decision making in regard to individual quality issues.
- Set up the BR (Business Reform) Communication Kaizen Department to promote better communication between the president and stakeholders inside and outside the company.
- Provide executives with media training.
- Press ahead with six initiatives for fulfilling the president's expressed commitment to restoring customer confidence in Toyota.

#### *5-1-3. Foreseeable benefits of the countermeasures*

- The establishment of the Special Committee for Global Quality and the related building of locally based quick-response frameworks in principal regions are promising new departures for Toyota.
- Crisis-management communication with stakeholders is likely to improve as a result of the establishment of the BR Communication Kaizen Department, and the newly established task force promises to contribute to faster decision making in addressing serious problems.
- Toyota has designated February 24, the day of the president's congressional testimony, as the date of a new start for the company. That would seem to be an effective measure for remembering the problems that occurred and for keeping people at Toyota focused on the company's basics.

#### *5-1-4. Issues that require further attention*

##### *a. The role of senior management*

- i. Toyota's proposed system for addressing quality-related accidents provides for ensuring sound flows of pertinent information from the field to senior management. It doesn't provide, however, for determining the timing or channels for issuing statements by the president. Toyota needs to address that omission, especially in regard to statements in the wake of accidents involving fatalities, and other serious incidents. The company, meanwhile, is launching a task force to be led by an executive vice president. It needs to start, however, by establishing guidelines to ensure consistency in the task force's activities.
- ii. Toyota has been intensely focused on risk management (for preventing problems), but the company's crisis management (for coping with serious problems) is weak. Being prepared to cope with unfortunate events is an important part of adopting a customer perspective in management.
- iii. Toyota needs to monitor the performance of the crisis management systems that it is putting in place around the world.

- iv. To ensure genuinely free flows of field information to senior management, Toyota needs to encourage robust communication. That means more than simply installing suggestion boxes. And it means encouraging employee proactiveness in every kind of workplace, including manufacturing, sales, and other operations. The company needs to foster a workplace atmosphere in which employees feel free to voice their opinion and in which they feel free to adopt a perspective that transcends their own workplace.
- v. The occurrence of serious accidents necessitates a corporate stance that addresses everyone in the community at large as a stakeholder. At such times, Toyota needs to be straightforward in releasing important information, such as recall announcements, and the president needs to take the initiative in voicing the company's message.
- vi. An awareness gap is evident between senior management at Toyota and people in the workplace, including manufacturing, sales, and customer satisfaction divisions. Toyota needs to step up its efforts for ensuring free flows of information inside its organization. Those efforts should include measures for infusing communication with an awareness of customer perspectives and social expectations. In addition, Toyota should devote attention to quality issues and other issues in customer satisfaction at meetings of its board of directors and at other senior-management gatherings. Some other manufacturers have made such issues a regular subject for board meetings, and that can reinforce the momentum for measures for preventing problems.
- vii. Toyota should consider holding events, as several manufacturers of consumer goods do, for promoting interchange between its customer-hotline team and other divisions and for promoting interchange with consumer organizations and other important third parties. It should also secure periodic input, as on corporate anniversaries, from third-party observers, such as our panel.

*b. Mechanisms for supporting a crisis-management response*

*i. Determining what constitutes serious problems and addressing those problems*

The term "serious problems" arises in Toyota representatives' descriptions of gathering and sharing quality-related information from overseas. Toyota reportedly prioritizes problems by severity, but the company lacks clear guidelines for that prioritizing. Toyota should take this opportunity to establish workable guidelines and put them in place through systematic mechanisms. That should include prescribing

- the criteria for action,
- who is responsible for taking action, and
- when the action should take place.

Prescribing who is responsible is especially important, for clearly defined authority for coordinating activity is crucial in crisis management. The person responsible for certifying issues as serious problems would be a natural candidate to coordinate the company's response. That coordination function should include determining what to report to the president and to the executive vice presidents. Toyota needs to provide, meanwhile,

for special handling for information that pertains to issues deemed to be serious problems.

Company representatives have acknowledged a shortage of information about serious problems. Certifying issues as serious problems should actuate proactive information gathering. Rather than waiting for information to materialize, the company needs to take the initiative in determining the relevant facts.

*ii. Establishing initial-response guidelines for serious problems*

Toyota needs to establish guidelines for responding to serious problems while work is under way on determining the causes and deciding whether to conduct a service campaign or recall. Those guidelines should address at least the following items:

- how promptly the president and executive vice presidents need to be notified; that is, whether the problem is serious enough to warrant even late-night notification; and
- interim measures, including any of the following deemed necessary:
  - spot repairs;
  - individual alerts to vehicle owners via mail and e-mail;
  - alerts to the public via the Internet, television, newspapers, and other media;
  - individual appeals to vehicle owners via mail and e-mail to refrain from driving the vehicles in question;
  - appeals to the public via the Internet, television, newspapers, and other media to refrain from driving the vehicles in question; and
  - the temporary suspension of sales of the vehicles in question

*iii. Applying the initial-response guidelines*

Toyota needs to implement its initial-response guidelines for serious problems as soon as possible, and that will require frequent training for employees. The company also needs to support the implementation of the guidelines with continuing plan-do-check-act cycles, especially in regard to the following items:

- whether people complied with the guidelines in sales and service, in the customer-hotline divisions, in quality assurance, in public affairs, and other sectors
- what was wrong with the guidelines in instances where action was ineffective despite compliance with the guidelines
- if people did not comply with the guidelines, why they didn't; for instance, whether a failure occurred in communication, whether workplace awareness was insufficient, or whether headquarters was insufficiently persistent in emphasizing the importance of complying with the guidelines

## 5-2. Market-sensitive information gathering and public relations measures

### *5-2-1. Issues targeted by Toyota for improvement*

- Without being overly confident in the company's quality and technology track record, Toyota

should have systematically gathered information about changes and other facts from the market.

- Toyota's Public Affairs Division did not function as effectively as it should have. That division has an important responsibility for conveying the company's stance to external audiences. It failed to fulfill that responsibility fully, as in its handling of statements by the president.

#### *5-2-2. Toyota's proposed countermeasures*

- Hold public affairs strategy conferences and take other measures to improve communication among the public affairs divisions at headquarters in Japan and at overseas operations.
- Secure the support of consultants and other experts in strengthening Toyota's risk-monitoring system.

#### *5-2-3. Foreseeable benefits of the countermeasures*

The proposed countermeasures are especially promising in regard to improving cross-border communication.

#### *5-2-4. Issues that require further attention*

- a. Toyota's Public Affairs Division in Japan needs to abide more rigorously by the principle of venturing into the field to see what's happening and to ascertain the facts. It did not dispatch anyone to the United States immediately after the first occurrence of a serious quality-related accident. It therefore failed to secure a first-hand grasp of the media and customer responses there.
- b. People in public affairs at Toyota need to recognize and address the culture gap in media relations. They need to hold regular informal gatherings with overseas journalists. They also need to undergo training in how to deal effectively with different kinds of media. Those and other measures should take place in conjunction with measures for strengthening locally based media relations in each principal region.
- c. Toyota needs to address the accelerating diffusion of information through such personal channels as blogs and Twitter. Those channels disseminate information faster and more extensively than conventional mass media ever did. Toyota should secure expert third-party support in building capabilities for monitoring that information. Similarly, Toyota needs to upgrade its capabilities for monitoring the flows of information about fast-evolving automotive technologies, including information about competitors, and for acting on its findings.

## **6. Other Considerations in Addressing Quality Issues**

Our evaluation of Toyota's measures for improving its quality assurance function centered on three issues specified by the company: floor mat interference with accelerator pedals, accelerator pedals that were slow to return to their non-depressed position, and a defect in the Prius braking

system (ABS software program). In regard to those issues and to the models affected, Toyota's technical countermeasures appear to be effective means of preventing the recurrence of the problems.

Shortening the accelerator pedal, for example, has diminished the danger of interference by the floor mat for the time being. The brake-override system, meanwhile, appears to be an effective, long-term solution for preventing unintended acceleration. That system well warrants installation in a broadening range of models

Below are some issues to which Toyota needs to devote further attention.

- a. Toyota needs to work systematically to monitor the effectiveness of the countermeasures deployed in the recall repairs. That means carefully monitoring the patterns of complaints in regard to vehicles that have undergone the repairs.
- b. The company presumably had good reasons for adopting the accelerator pedal design of the length used before the recall. It needs to study whether shortening the pedal has entailed compromises in ease of use or in safety that need to be addressed.
- c. Toyota should consider adopting design features to heighten customer awareness of the need for securing the floor mats properly. For example, the floor-mounted clips for securing the floor mats and the holes in the mats for attaching the clips seem inordinately small. The dull color of the clips, meanwhile, makes them inconspicuous. Toyota should consider adopting larger clips and clip holes and a more-prominent clip color, such as yellow.
- d. The brake-override system, as a new kind of function, demands thorough evaluation in regard to its performance. That system is a promising failsafe feature for stopping a car if a driver accidentally depresses the accelerator and brake pedals simultaneously. Toyota needs to perform wide-ranging testing to verify the reliability of that feature.
- e. A lesson from the accidents caused by floor mats was the inadequate training of dealers' maintenance and repair personnel and the inadequacy of quality and safety updates for those personnel. Underlining that problem were the tragic consequences of installing an incompatible floor mat in a loaner vehicle. Toyota needs to step up its dealer supervision, including safety-related guidance for the personnel in the dealers' maintenance and repair shops. And it needs to conduct follow-up monitoring to determine whether measures for preventing the recurrence of problems are working.
- f. Toyota issued a U.S. "technical service bulletin" in 2007 to warn against installing multiple floor mats on the driver's side, and it conducted a limited U.S. recall of all-weather floor mats. Those measures, however, apparently failed to reach a very high percentage of the intended coverage. Toyota needs to review that episode and take steps to ensure more-comprehensive reach for future service campaigns and recalls.

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