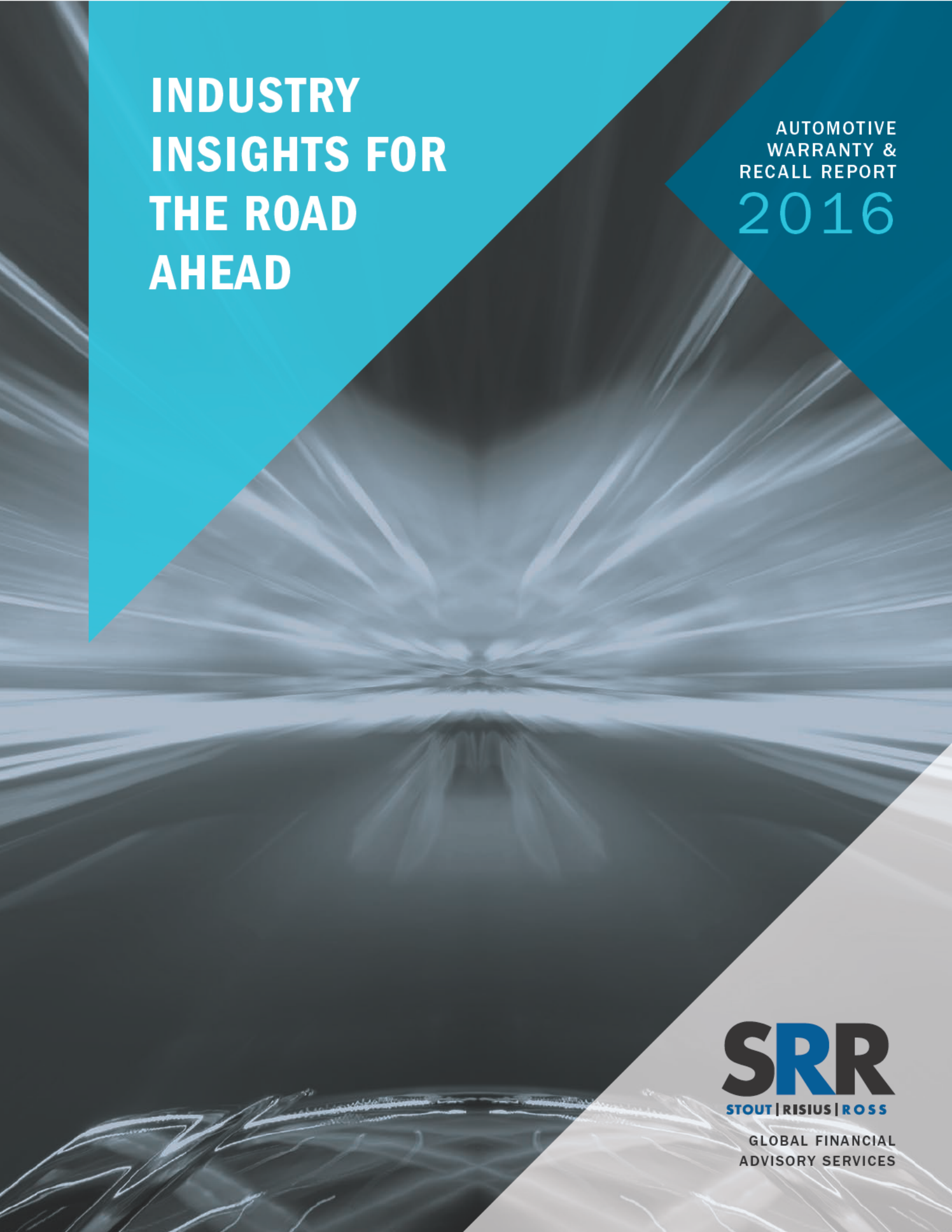
INDUSTRY INSIGHTS FOR THE ROAD AHEAD

AUTOMOTIVE WARRANTY & RECALL REPORT

2016



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INTRODUCTION

The second annual *Automotive Warranty & Recall Report* is designed to provide information and insights to automotive industry leaders based on exclusive analysis of recall-related data. Last year's report clearly pointed to an industry on the cusp of a new era of heightened recall activity.

Our analysis of 2015 shows that the new era has arrived. In fact, it reflects a pattern started in 2014 – a year influenced by a massive recall of the General Motors ignition switch. In 2015 the Takata air bag recall propelled another record year.

Given the strong influence of GM and Takata on the overall numbers for 2014 and 2015, it's possible that some might view those years as aberrations. What are the odds we'll actually have a third straight year of mega-recalls?

This report examines the many reasons recall numbers reached an all-time high in 2014 and again in 2015, and why they portend an elevated number of recalls in the years ahead.

For example, a key indicator of future recalls is the increasingly proactive relationship between empowered federal regulators and the automotive industry. We will look at how the National Highway Traffic Safety Administration's (NHTSA) interaction with automakers and suppliers has evolved, how it played out in 2015, and what to expect in future years.

We also examine the following topics as they relate to recalls and risks for OEMs and suppliers in 2016 and beyond, providing insights for the road ahead:

COMPLETION RATES: Regulators are demanding that OEMs increase completion rates, going so far as to issue consent orders to enforce stronger compliance. By examining how consumers respond to recall communications from OEMs, we've identified ways that OEMs can increase completion rates through improved outreach and communication to vehicle owners.

TECHNOLOGY: Software-related recalls have significantly increased in the last several years. As vehicle technology continues to advance, we explore the many ways in which technology and recalls are intersecting – including the opportunities and challenges technology will present.

FINANCIAL PREPARATION: We evaluate how automakers and major suppliers are adjusting for recalls, and why suppliers might have more financial exposure in 2016 and beyond.

REPORT BACKGROUND

The *Automotive Warranty & Recall Report* is the industry's most comprehensive and integrated assessment of recall risks, trends and costs. It is an analysis of important metrics that drive those areas, incorporating data from recalls, technical service bulletins, investigations financial reporting, international campaigns and other sources.

This report combines Stout Risius Ross (SRR)'s qualitative and quantitative approaches to understanding automotive industry recall risks and costs. It stems from original research that Neil Steinkamp and his team began in 2013. This is the second year for this comprehensive report, which compiles and analyzes prior-year data in order to predict likely trends for the coming year and beyond.

The evaluation and forecasting provided by Steinkamp and his team have greatly influenced the conversation about automotive recalls and how they impact OEMs and suppliers.

Steinkamp is a Managing Director at SRR. He has extensive experience providing business and financial advice to corporate executives, risk managers, in-house counsel and trial attorneys. Steinkamp is frequently engaged as an expert to advise on matters involving automotive warranties and recall costs. His practice includes consulting services for automotive OEMs, suppliers and their advisors.

OVERVIEW

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2015 REVIEW: THE NEW NORMAL TAKES ROOT

"The process of adjustment to this new regulatory environment is going to be painful. We're not used to this, and I think that we need to just step up."

Sergio Marchionne, CEO, Fiat Chrysler Automobiles

While it's nearly impossible to predict future massive recalls on the scale of GM or Takata, it's clear that the "new normal" of high recall figures is taking hold and that overall recall numbers will remain elevated and possibly increase for years to come.

Signs of this new normal include:

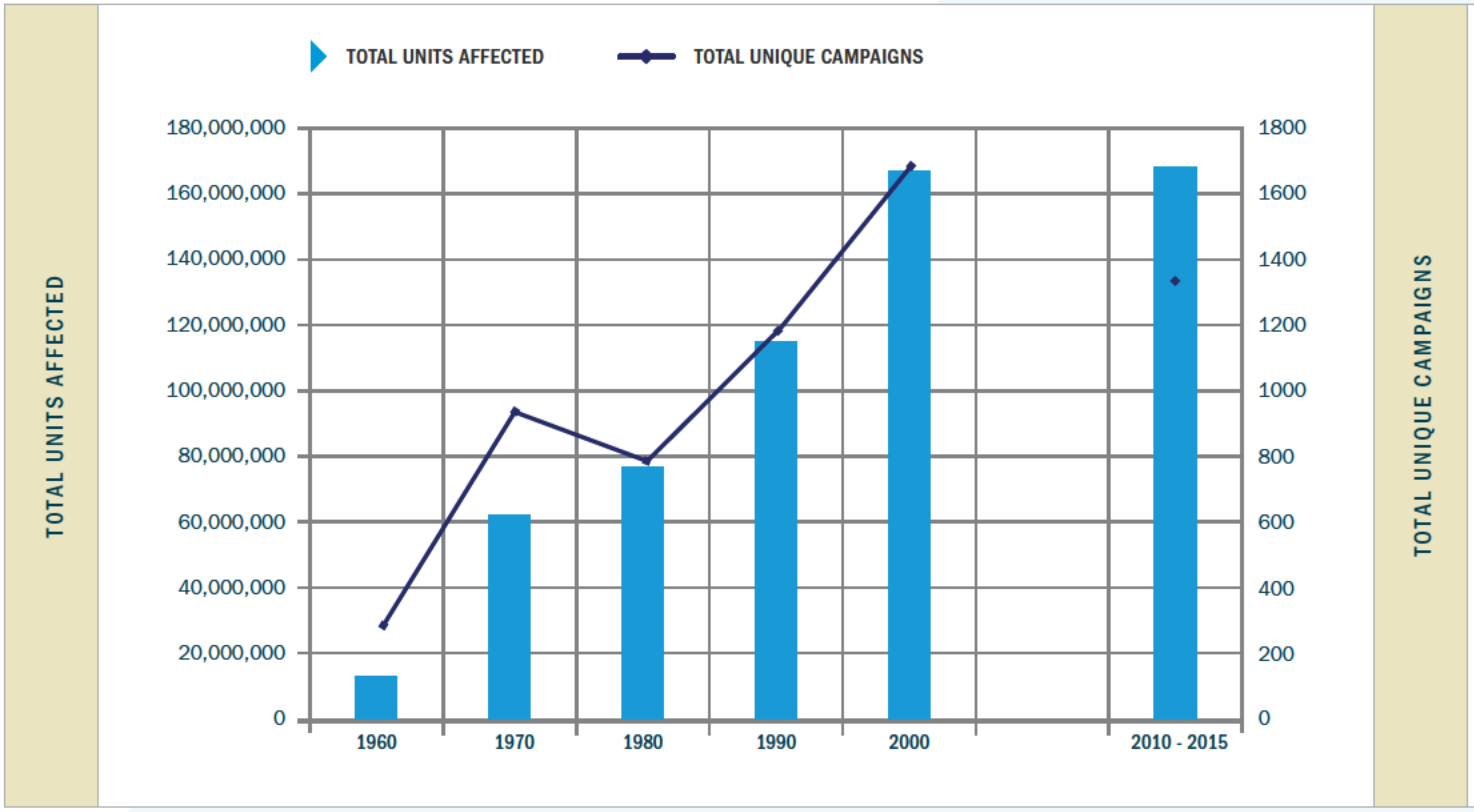
- Unprecedented actions by the National Highway Traffic Safety Administration (NHTSA) to force change on the industry
- Automakers taking federal recall-related requirements more seriously because of concern about NHTSA fines and increased oversight
- Continued public and lawmaker interest, which has affected – and put pressure on – both automakers and regulators

The result? Major, unexpected recalls aside, we believe the industry should expect 30 to 50 million vehicles to be recalled each year for the foreseeable future.

Already, the total number of recalled units for the period of 2010 – 2015 is ahead of the record-setting decade of the 2000s. The number of total unique recall campaigns isn't far behind.

OVERALL RECALL TRENDS

UNIQUE CAMPAIGNS AND UNITS AFFECTED BY DECADE



Includes BMW, Daimler, FCA, Ford, GM, Honda, Hyundai, Isuzu, Kia, Mazda, Mitsubishi, Nissan, Subaru, Tata Motors, Tesla, Toyota, Volkswagen and Volvo. Contains data through December 2015.

RECORD-BREAKING STATISTICS

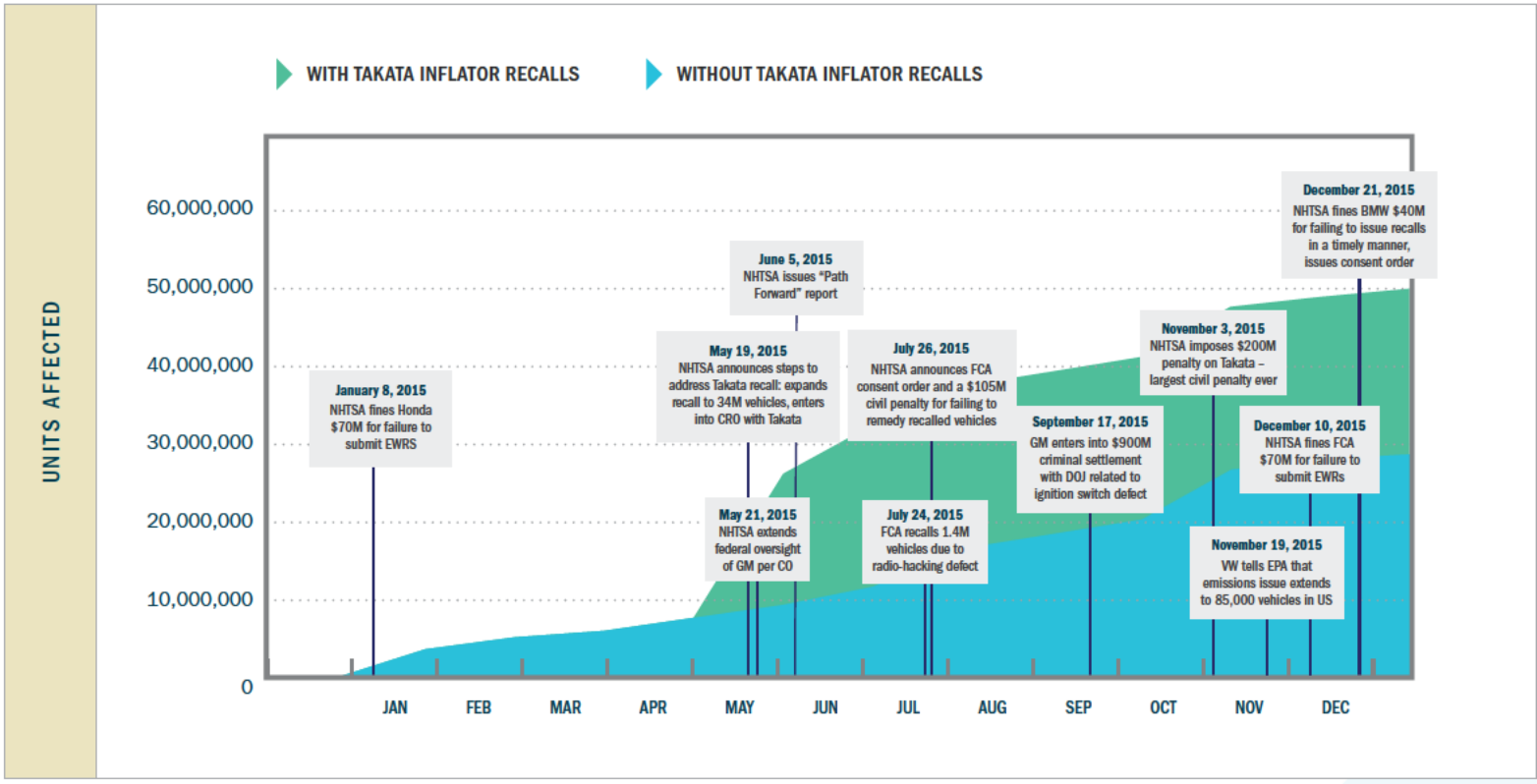
Last year was record-setting both in the number of autos recalled and recall campaigns. NHTSA recorded 51 million vehicle recalls in 2015, slightly more than the 2014 total, which was adjusted downward from about 64 million to just under 51 million due to double-counting that occurred in 2014 related to the Takata recall.

51M Number of recalls in 2015, a record

Some key statistics about the 2015 recalls:

- There were almost 900 separate recall actions, nearly 100 more than the previous year.
- Takata air bag inflators were linked to approximately 42 percent of recalled vehicles in 2015 (more than 6.2 million).
- The largest non-Takata recall of 2015 was issued by Toyota, related to a power window electrical switch that could short-circuit and potentially catch fire. It affected more than 1.8 million units.

2015 TIMELINE OF UNITS AFFECTED



REGULATORS USING ENFORCEMENT TOOLS IN NEW WAYS

In 2014, NHTSA became more public in its criticism of the way OEMs deal with vehicle defects. In 2015, the agency backed up its tougher words with actions, issuing fines and consent orders against several OEMs and suppliers. Clearly, NHTSA has sent a message to OEMs and suppliers that safety-related requirements can't be ignored.

The following illustrate NHTSA's enforcement activity:

- **NHTSA assessed nearly $500 million in civil penalties in 2015 – by far the most of any year in the agency's history.**
- **Takata was informed of a record $200 million civil penalty for failing to issue a timely recall and providing selective, incomplete or inaccurate data to NHTSA and customers.**
- **NHTSA fined FCA $105 million for violating the Motor Vehicle Safety Act relating to effective and timely recall remedies, notification to vehicle owners and dealers, and notifications to NHTSA.**
- **Honda received a $70 million fine for failing to provide Early Warning data.**

In 2015, NHTSA also took a page out of the Department of Justice's (DOJ) playbook and negotiated consent orders with FCA, BMW and Takata. The DOJ has used the orders in cases such as the GM ignition switch recall.

A consent order is a severely corrective regulatory mechanism that gives NHTSA the power to impose specific, new requirements on individual OEMs or suppliers. The agency has never before used this mechanism with manufacturers to enforce recall-related issues. Further, only rarely have consent orders been used in this context – noncriminal, corporate civil infractions.

NHTSA doesn't have the power to fire executives, but with consent orders it can make their lives much more difficult by imposing strict oversight restrictions. For example, OEMs can be required to retain an NHTSA-approved safety consultant and use data analytics to see if they can catch emerging safety-related problems.

FCA had to endure a public hearing in which NHTSA officials accused the company of improperly handling 23 individual recalls that included about 11 million vehicles. A few weeks after the hearing, NHTSA levied a $105 million civil penalty – its largest ever at the time – on the company. It also issued a consent order forcing unprecedented oversight for the next three years, including the hiring of an independent monitor approved by NHTSA to assess, track and report the company's recall performance.

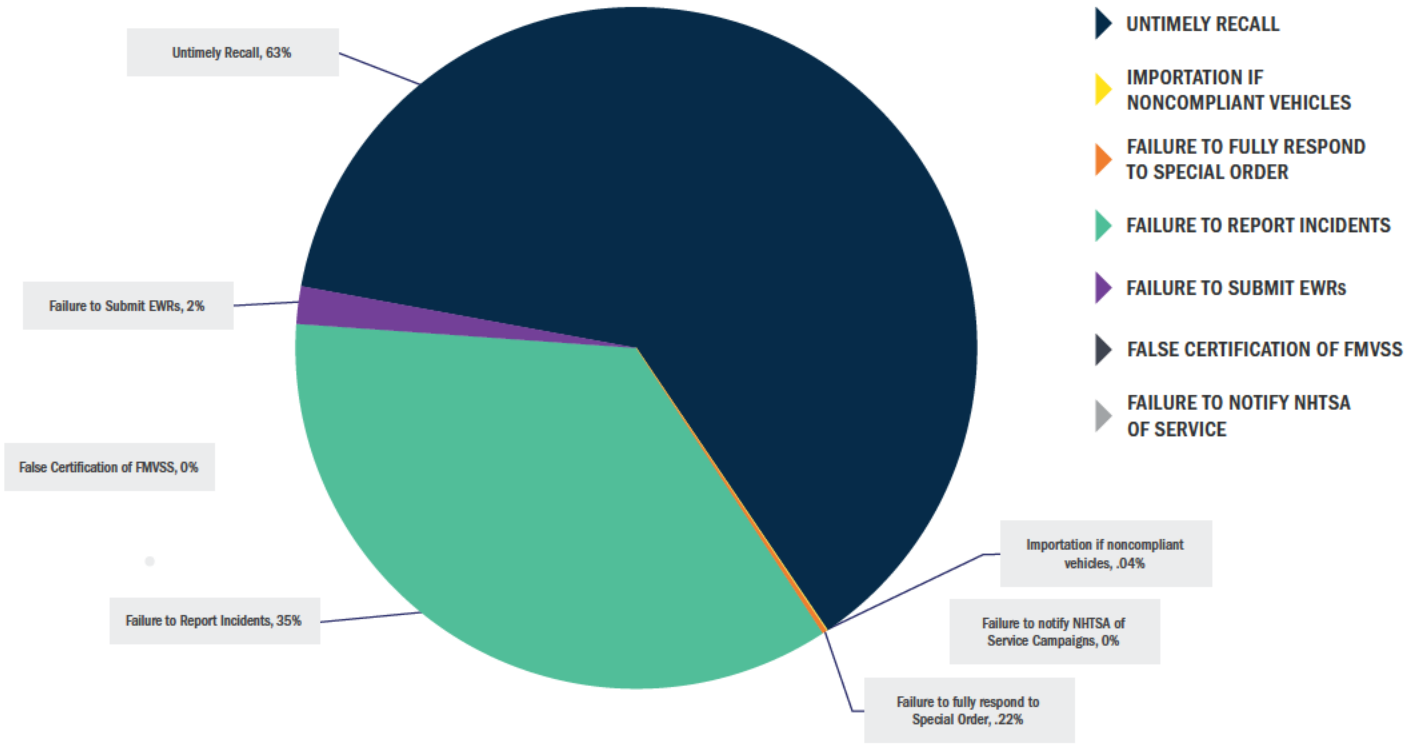
The Honda fine was an outgrowth of the company's failure to report certain instances of people being injured or dying as a result of a manufacturer defect. NHTSA relies on such reports to help it decide whether to ask for a recall toward preventing further injury or death.

By issuing fines and consent orders, NHTSA is showing its displeasure in a very public way. Consent orders are an extraordinary mechanism to force change. Clearly, NHTSA's view is that the industry's pervasive record of failures warrants extraordinary measures.

As this chart shows, the vast majority of the fines leveled by NHTSA addressed shortcomings they saw in OEMs' untimely recalls and failure to report incidents.

TOTAL NHTSA FINES BY SUBJECT

LIGHT VEHICLE MANUFACTURERS ONLY – LAST 5 YEARS



HOW OEMS ARE REACTING

It's apparent that manufacturers' threshold for initiating recalls has come down. OEMs are adopting a more proactive philosophy that identifies defective components and orders recalls before the components cause a safety-related problem down the road.

One interesting observation from OEMs in 2015 and early 2016 is numerous examples of recalls that were not prompted by an injury or death, such as:

- **General Motors recalled more than 473,000 trucks and SUVs in the U.S. and Canada because the brake pedals can loosen and fail to work properly.**
- **Nissan recalled some Altima 2013 – 2015 model year sedans because of an issue with the secondary hood latch. This was the third recall on this particular part, the NHTSA said.**
- **Ford issued a recall for its F-150 in North America due to a seat-related issue that was not safety related.**
- **Mazda recalled about 237,000 CX-5 SUVs because the fuel filler pipe can rupture in a rear crash and cause a gas leak and possible fire, although no fires or injuries were reported.**

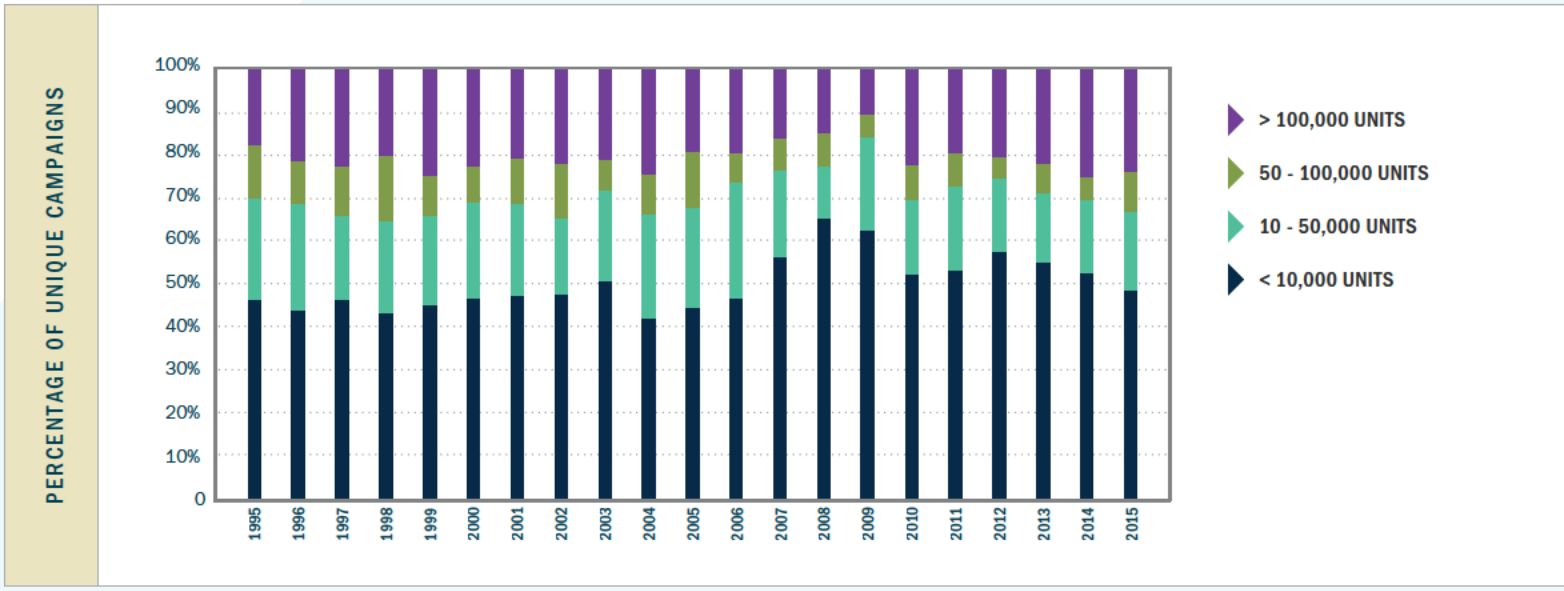
These recalls are, in part, driven by NHTSA's increased vigilance and public goal of zero deaths on the road. As NHTSA continues its proactive enforcement, there will continue to be more proactive recalls.

Overall, mid-sized recalls – defined as 10,000 to 100,000 units – grew in 2015, which is a sign of increased willingness by automakers to order recalls based on issues that previously might have been ignored.

On this chart, the red and green segments signify an increase in mid-sized recalls (10,000 – 50,000 unit recalls as well as 50,000 – 100,000 unit recalls).

SUMMARY OF RECALL TRENDS

UNIQUE RECALLS BY SIZE (UNIQUE CAMPAIGNS)



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Automakers are taking other proactive measures as well. One of the most noteworthy announcements at this year's North American International Auto Show in Detroit was an agreement between 17 automakers and the Department of Transportation to work together so that safety-related issues can be quickly identified and resolved before the public is endangered.

This agreement followed a December meeting in Chicago called by NHTSA in which regulators and automakers discussed improving safety culture, boosting recall completion rates, cyber security, and making changes to early warning data-reporting systems, according to Reuters.

It remains to be seen how this new spirit of cooperation between automakers and regulators will play out in 2016 and beyond. After all, the OEMs are not the only ones who are trying to burnish their reputations. NHTSA, which was criticized for the way it mishandled major safety issues such as the GM ignition switch, is also looking to rebuild its relationship with Congress.

COMPLETION RATES: AN ONGOING BATTLE

"100 percent is a real challenge, but it has to be our ambition."

Mark Rosekind, NHTSA Administrator

For as much as automakers try to increase their completion rates, there is one figure they can't escape: 47 million vehicles remain on the road with at least one unrepaired safety recall, according to a recent Carfax analysis.

That's why NHTSA is keeping the pressure on OEMs.

"As we've said repeatedly and emphasized again," NHTSA Administrator Mark Rosekind declared last year, "it's not enough to identify defects. To save lives and prevent injuries, defects must be repaired."

Solving the completion rate gap is one of the most vexing problems for automakers because as cars get older, recall completion percentages plummet.

47M Number of vehicles on the road with at least one unrepaired safety recall

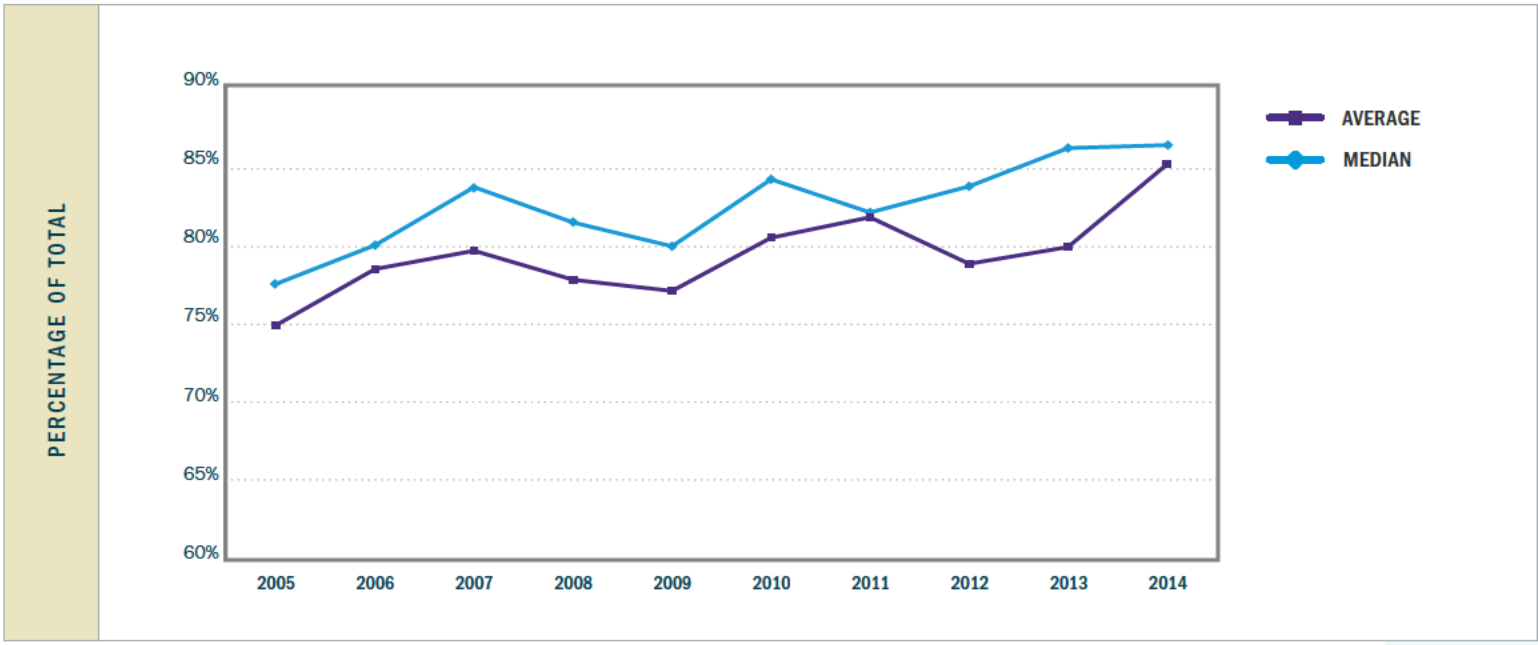
But regulators aren't willing to accept excuses for low completion rates. The way NHTSA looks at it, when an automaker announces a recall, that automaker believes there is a safety risk to consumers. Therefore, it must try to find and repair all affected vehicles.

Regulators' focus on the 100-percent standard for all recalls might not have been taken seriously in past years, but that's changing. If NHTSA believes an automaker or supplier isn't doing enough to bring up completion percentages, it could require a public hearing, airing the company's failures and announcing fines and consent orders. Industry leaders are taking this seriously, exploring new and innovating ways to increase completion rates and to ensure the safety of vehicle owners and occupants.

NHTSA is doing more than issuing threats and penalties. It is making efforts to help the automakers, even conducting educational workshops in cooperation with the industry. One example was the "Retooling Recalls: Getting to 100% Completion" meeting held last April, at which regulators, manufacturers, safety advocates and researchers examined ways to increase recall completion rates. NHTSA also started the "Safe Cars Save Lives" public awareness campaign in January 2016, urging consumers to check the NHTSA website at least twice a year to see if their vehicle is part of a recall.

OVERALL MEDIAN AND AVERAGE COMPLETION RATES BY YEAR (2005-2014)

INCLUDES ONLY RECALLS WITH 6 OR MORE REPORTED QUARTERS



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OLDER VEHICLES, BIGGER RECALL PROBLEMS

There are many factors that impact auto recall completion rates. Some of the most important include:

VEHICLE AGE: Completion rates for recalls involving older vehicles are generally lower, sometimes significantly. This becomes more pronounced as vehicles age.

RECALL SIZE: Completion rates for larger recalls (greater than 100,000 units) are often approximately 5 percent to 10 percent lower than for smaller-scale recalls.

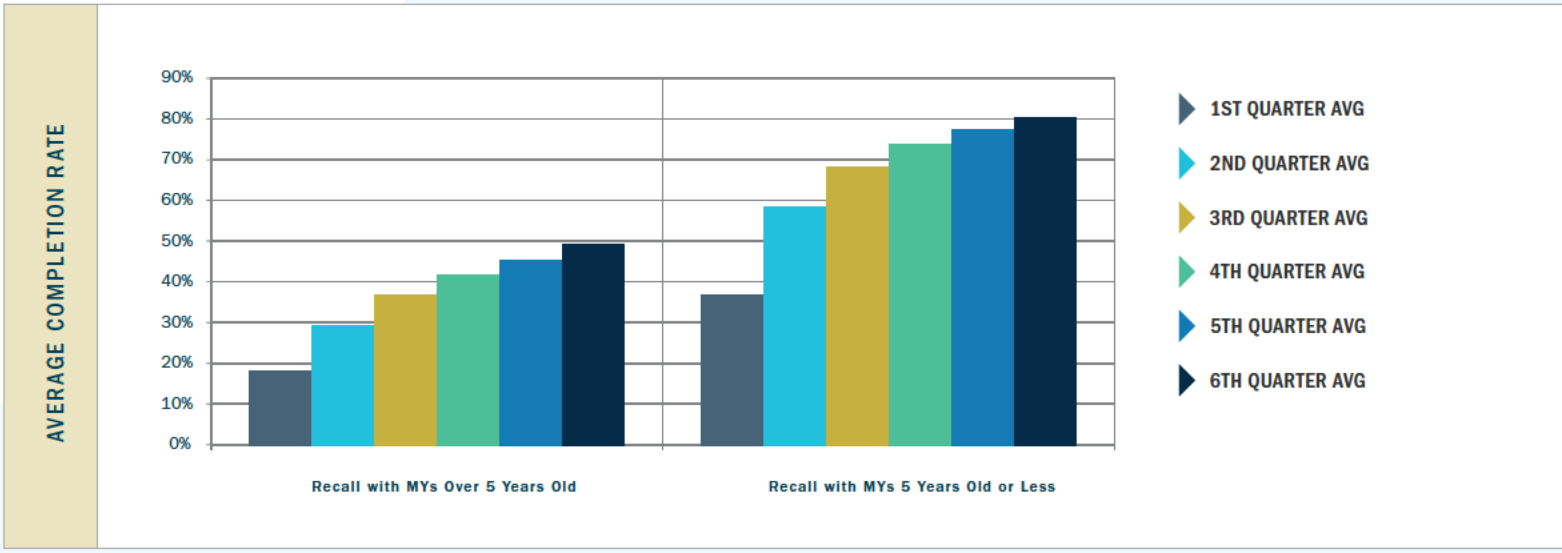
VEHICLE TYPE: Completion rates for trucks and minivans appear to be different from those for sedans and full-size vehicles.

OWNER ABILITY TO SELF-DIAGNOSE: If the vehicle owner can easily self-diagnose whether the vehicle suffers from the defect, it might make the owner less likely to believe it's a problem that's worth a visit to the dealership.

This section focuses on the most stubborn issue for automakers – the wide variance between completion rates for older and newer vehicles. Newer cars (less than 3 years old) often hit 80 percent to 90 percent completion rates. Older ones struggle to hit 50 percent. This chart shows the stark difference between completion rates for vehicles up to 5 years old, as opposed to those older than 5 years.

SUMMARY OF RECALL TRENDS BY AGE

COMPLETION RATES FOR RECALLS WITH AT LEAST 6 QUARTERS OF QPR DATA (LAST 10 YEARS)



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Owners of newer cars head to their dealerships for regular service and repairs covered under warranty, as well as for free oil changes and other maintenance programs.

Defects can often surface quickly in newer models, and there is a significant incentive for manufacturers to find them. OEMs would much rather conduct a recall when a car is newer because of the frequency of the touchpoints between the dealership and the owner. In addition, recall costs can often be more easily contained when the problem is diagnosed earlier and repaired earlier.

Completion rates drop as a vehicle ages. This is due to a variety of reasons:

- **The value of the car is declining**
- **The owner of the car is less likely to be the person who originally bought the car, and may even be the car's third or fourth owner**
- **The car may have other, more pressing repair-related issues**
- **The owner doesn't have a relationship with and/or doesn't live near a dealership**

5 years Automobiles this old or older are less likely to be repaired in recalls

It's less common for a recall to include cars 5 years old or more: Under 10 percent of recalls focus on this age group. But they are tough nuts to crack. For years, automakers weren't expected to focus on completion rates for these models, but the landscape has changed. The GM ignition switch and Takata airbag recalls helped shine the spotlight on this issue because of the significant number of older cars affected by these recall events.

Addressing the completion rate shortfall is one of the most difficult challenges for the industry right now.

The way NHTSA sees it, automakers have developed groundbreaking technology to improve fuel economy and performance and have incorporated countless other advancements into the vehicles they've built. So why can't they fix this?

WHY PERSONALIZATION IS PART OF THE SOLUTION

For more insight into why some recalls are more successful than others, we examined how automakers communicate with their customers.

Increasing completion rates is not just a matter of improving notification and awareness – it requires overcoming myriad other complications with the current vehicle owners who are likely not the original owners.

Typically, automakers would send a series of letters to vehicle owners: the first within 60 days of a recall notification, followed by second and third letters, if needed, in succeeding months. This was an accepted protocol.

Now, some manufacturers are using social media, advertisements and other methods to draw owners into dealerships to fix the defective parts. But completion rates are still falling short.

SRR reviewed the actual 577 owner notification letters for 1,444 recalls, and collected a standardized set of 32 data points from each letter detailing specific characteristics of the communication between OEMs and vehicle owners. SRR cross-referenced this data with NHTSA recall and quarterly completion rate data to identify relationships between 577 owner notification letter characteristics and recall completion rates.

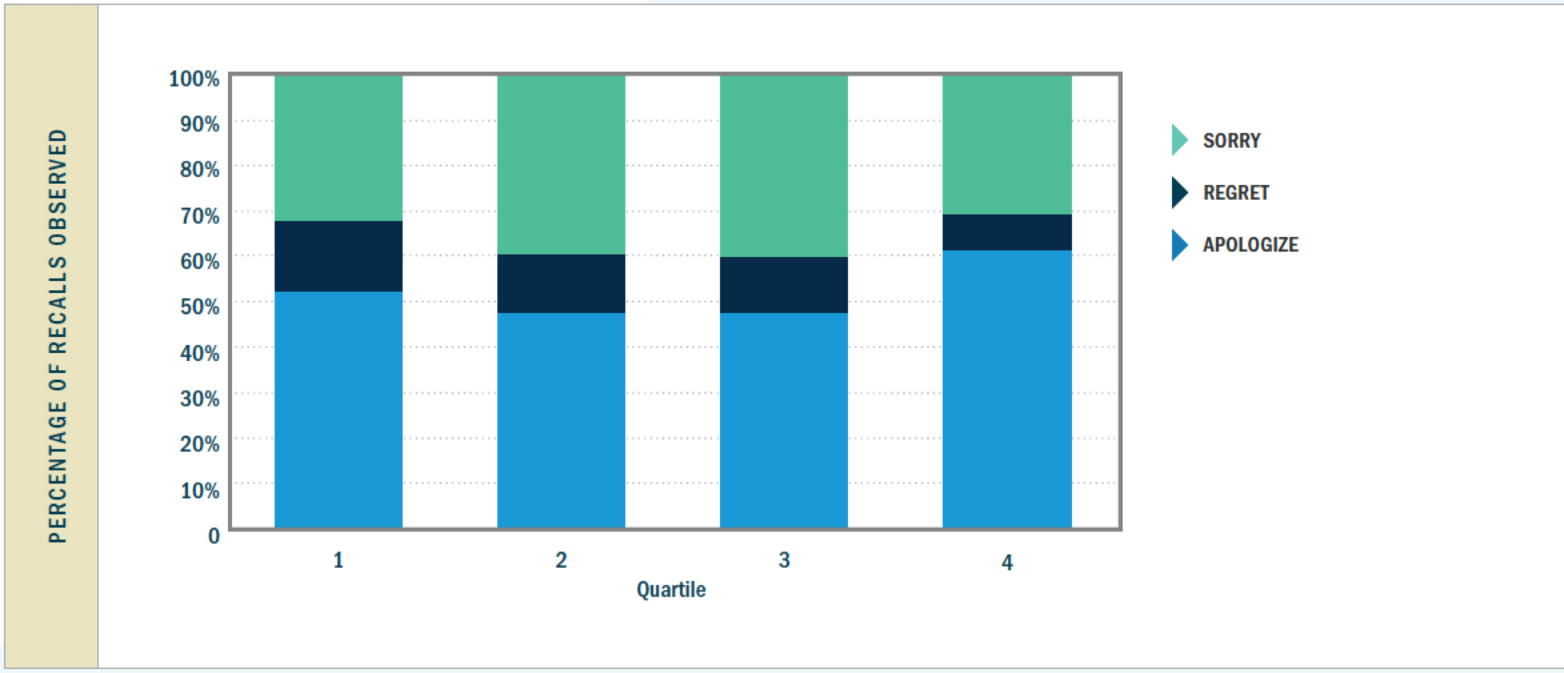
Our analysis indicates that automakers should consider personalization as a strategy to raise completion rates. Demographic factors, such as the owner's lifestyle and how the vehicle is used, are important factors in determining how willing the owner might be to get the vehicle repaired.

For example: The owner of a compact car who lives in a suburb that's within a mile of a dealership may need a different letter and related communication than the owner of a pickup who lives in a rural area an hour or more away from a dealership.

We also found that owners respond differently to specific elements of notification letters, including personalized salutations, impact words and apology statements.

For example, this chart shows that when the word "apologize" was used in a recall letter, the completion rate was enhanced. The quartiles in the chart represent groups of recalls with the lowest performing recall completion rates (quartile 1) on the left to best performing recall completion rates (quartile 4) on the right.

APOLOGY WORD USED



"Apologize"

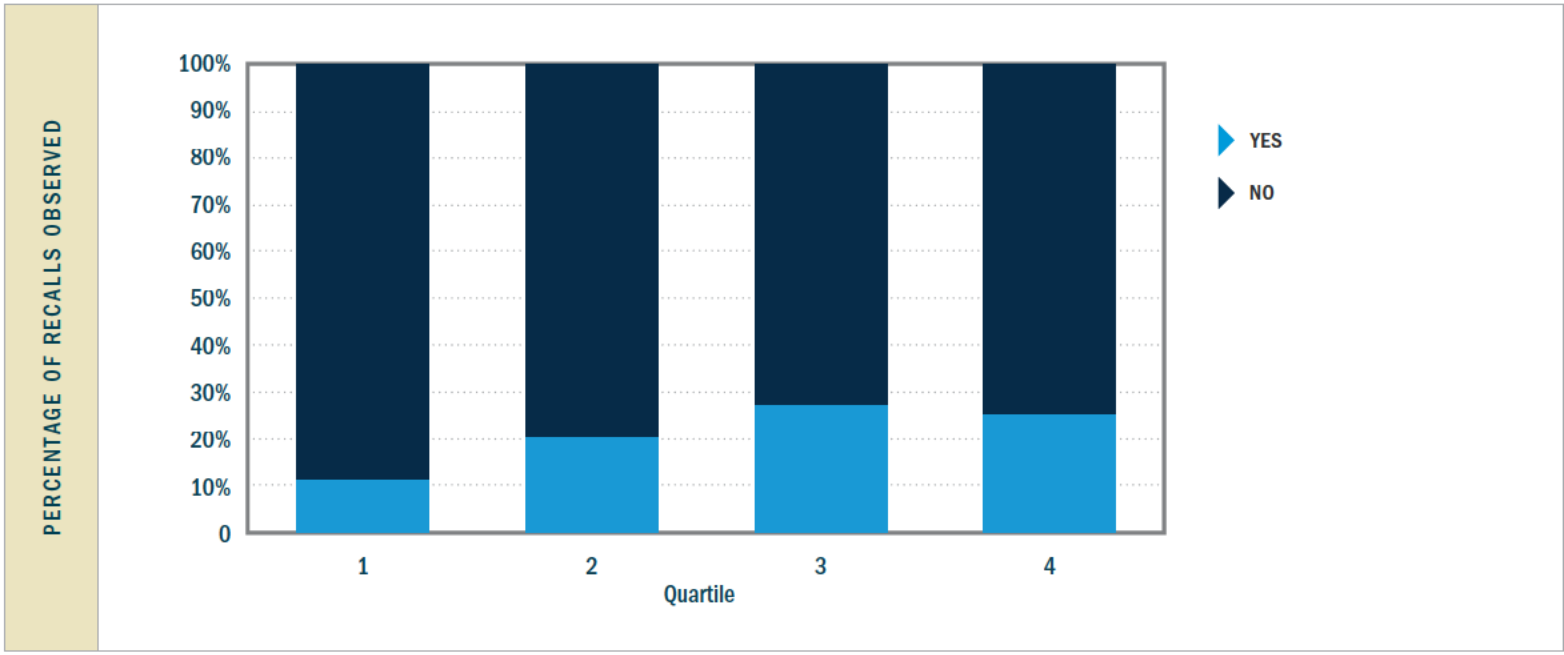
A word that can help automakers get better recall response from their letters to owners

Another chart that breaks down the quartile data by type of automobile shows that pickup truck owners in the high-performing quartile 4 responded much more positively to the word "sorry" than "apologize" or "regret" in a recall letter all else held equal.

Additional research revealed that "apologize" and "sorry" performed better than "regret" in recalls of newer vehicles. "Sorry" performed only marginally better than other apology words in recalls of vehicles 3 – 5 years old. "Apologize" performed best in recalls of older vehicles.

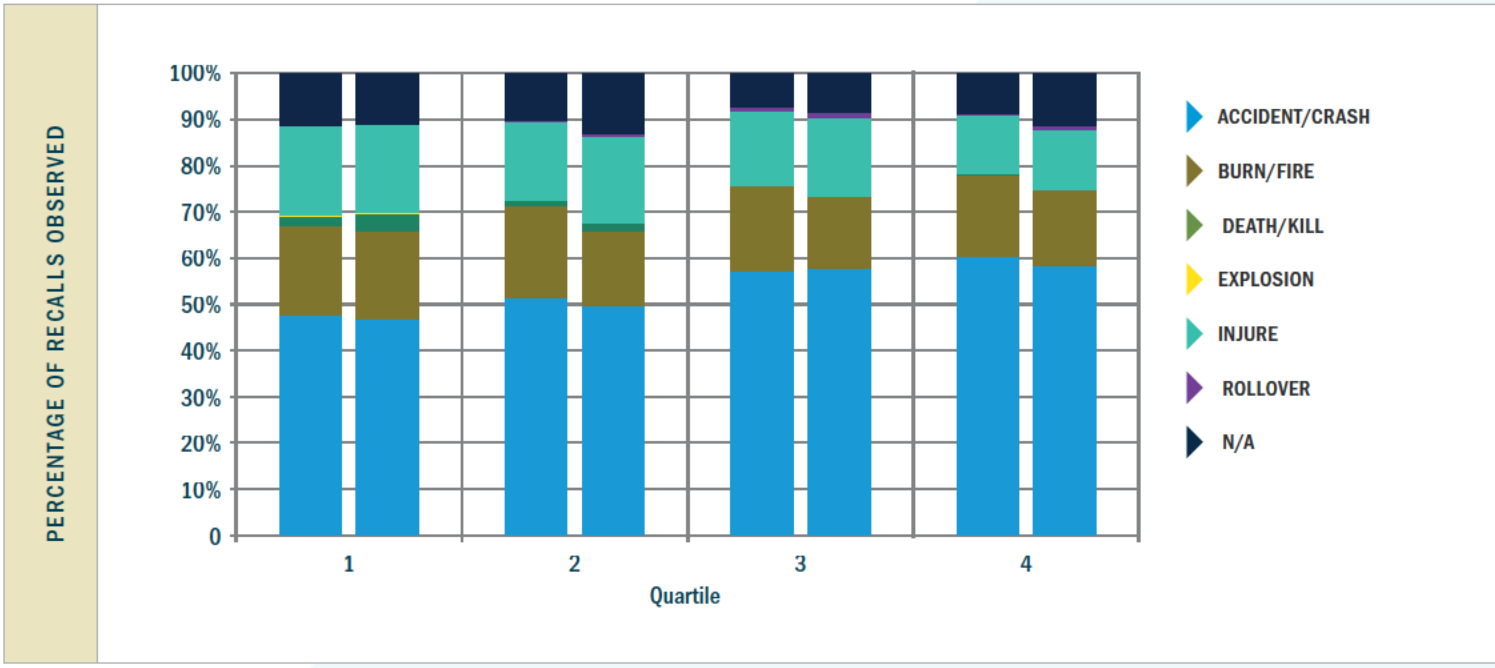
Personalized text is also important. This chart also indicated that completion rates markedly improved when owner notification letters contained a personalized salutation (e.g., "Dear Mr. Smith") instead of a generic greeting (e.g., "Dear Customer").

PERSONALIZED TEXT



Most people would think that words such as “death” and “explosion” would be sure-fire ways to grab an owner’s attention. Actually, “crash” and “accident” performed better, as you can see in this chart. It’s possible that drivers are more worried about an inconvenience that’s likely to disrupt their lives than severe ramifications that they might see as “scare tactics.”

IMPACT WORD



The length of an owner notification letter can affect perceptions and the likelihood of a recall as well. This chart showed that the letters associated with the highest-performing recalls more often contain two pages with well-spaced copy that is easy to read. One-page letters can be dismissed as junk mail. Two pages were perceived as more legitimate.

Improving completion rates will require an appreciation that in many instances the problem is not one of awareness, but rather motivation. Vehicle owners are receiving the letters sent by the OEMs and are choosing not to have the vehicle repaired. The reasons for this could be many – the owner weighs inconvenience as the most important factor and the OEM is not assisting in overcoming this; the words used to communicate with the vehicle owner are not addressing the concerns and frustrations of the vehicle owner; or the vehicle owner may not fully appreciate the nature of the defect and its potential impact on the vehicle owner, passengers or their day-to-day lives.

The data clearly shows that automakers should develop tailored, specific methods and processes for communicating with specific populations of vehicle owners. It can’t be one-size-fits-all. For smaller-scale

recalls of a newer vehicle, a manufacturer may be able to use one process. If the circumstances are more complex, the company may require a protocol of additional methods, tactics and tools that are implemented at various stages in order to further enhance completion.

One technique is to make sure the notification letter addresses the owner's most important "pain point." When writing to a sedan owner, who likely needs their car to drive to work, a recall letter might help the owner understand that ignoring the defect could make the car inoperable, causing significant inconvenience. Safety concerns might not be enough, because people often assume that the worst-case scenarios won't happen to them. They may consider the possibility of missing a day of work to be a more realistic problem.

Using the right tone, language and incentives can bring the owner into a dealership. This creates an opportunity for the OEM to develop a relationship that may eventually lead to a new vehicle sale down the road.

WHY THE VW RECALL WILL BE DIFFERENT

Last year's most publicized story about an automobile defect was when the Environmental Protection Agency (EPA) cited Volkswagen for bypassing the emissions control system in almost 500,000 vehicles sold in the U.S. (and many more globally).

The EPA issued a notice of violation to the automaker, letting it know that the vehicles were discharging more pollutants than legally acceptable. Indications are that this could be the most expensive recall ever, topping out at $7 billion or more.

7 Number, in billions, the VW recall could reportedly cost

The completion of this recall will likely be much more challenging than a typical safety recall. Once Volkswagen figures out how to fix the issue in accordance with EPA standards, it will then need to entice people to return to dealerships for the repair. However, owners might resist the fix, particularly if it will have a negative effect on performance and gas mileage. As a result, VW will need strong incentives and proactive outreach to bring people into dealerships.

SOFTWARE: DEFECTS & OPPORTUNITIES

“The Department wants to speed the nation toward an era when vehicle safety is not just about surviving crashes; it is about avoiding them. Connected, automated vehicles that can sense the environment around them and communicate with other vehicles and with infrastructure have the potential to revolutionize road safety and save thousands of lives.”

Anthony Fox, U.S. Secretary of Transportation

When a smartphone’s software fails or a desktop computer’s operating system crashes, it can cause a major inconvenience. But it pales in comparison to a vehicle software failure that could affect braking, acceleration or any number of functions while we’re barreling down the highway at 70 mph.

That’s why vulnerabilities in software-connected components – from internal malfunction to external hacking – have been the subject of increased attention by manufacturers, regulators and the public.

Just in the last year:

- **Security experts identified a vulnerability that would allow a hacker to remotely control the entertainment system in a 2015 Jeep Cherokee, giving them access to various electronic control units in the vehicle. In response, FCA recalled 1.4 million vehicles equipped with 2013–2015 UConnect head unit systems.**
- **Jaguar Land Rover recalled approximately 65,000 Range Rover sport utility vehicles after discovering that a keyless entry software glitch caused some of the vehicles' doors to fly open unexpectedly, which could distract drivers or cause a crash.**
- **Nissan disabled the NissanConnect app that allowed Leaf owners to control the vehicle's climate system, after a security expert identified a vulnerability that could allow hackers to access the Leaf's temperature control and download its driving log.**
- **Volvo Car Group recalled 59,000 cars after some owners experienced their engines stopping and restarting while they were driving. Dealerships were asked to correct the software fault, which had not led to any accidents.**

63 Number of software-related recalls from late 2012 to June 2015

Software components have become increasingly crucial as vehicles become more technologically advanced. For example, according to *Wired* magazine, the Chevrolet Volt relies on 10 million lines of code in its operation, about 2 million more than required to operate an F-35 fighter jet.

SOFTWARE-RELATED RECALL TRENDS

SRR examined recalls of software-related components and found that they have dramatically increased in the last few years.

To classify a recall as a software component recall, SRR searched the "Defect Summary" and "Corrective Action" fields of NHTSA's Recall flat file for the term "software." SRR's inquiry captured descriptions of software-related defects identified specifically as such, as well as defects that were to be fixed by updating or changing a vehicle's software.

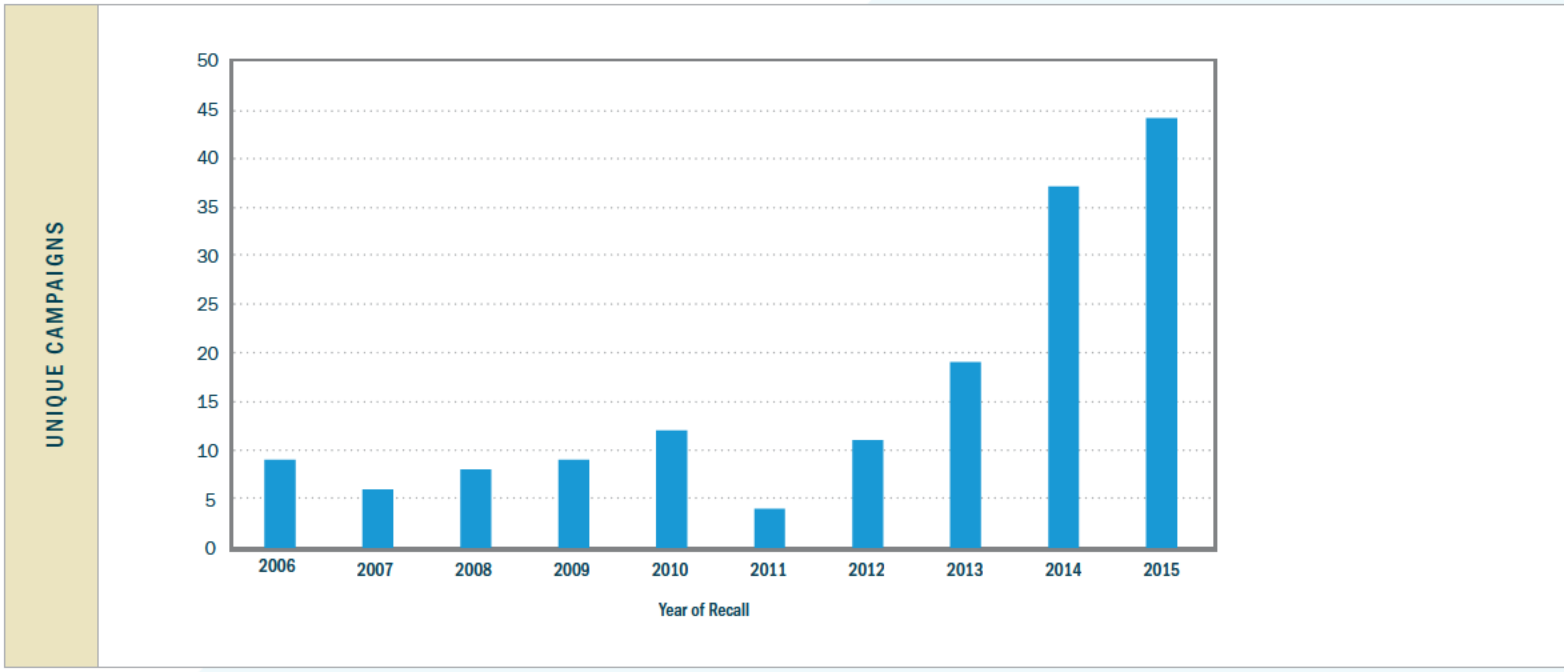
Since the end of 2012, there has been a marked increase in recall activity due to software issues. For the primary light vehicle makes and models we studied, 32 unique software-related recalls affected about 3.6 million vehicles from 2005 – 2012. However, in a much shorter time period from the end of 2012 to June 2015, there were 63 software-related recalls affecting 6.4 million more vehicles.

From less than 5 percent of all recalls in 2011, software-related recalls have risen to almost 15 percent in 2015. Overall, the amount of unique campaigns involving software has climbed dramatically, with nine times as many in 2015 than in 2011, as this chart indicates.

15% Percentage of recalls that were software-related in 2015

SUMMARY OF RECALL TRENDS

SUMMARY OF SOFTWARE RECALLS BY YEAR (LAST 10 YEARS) – UNIQUE CAMPAIGNS



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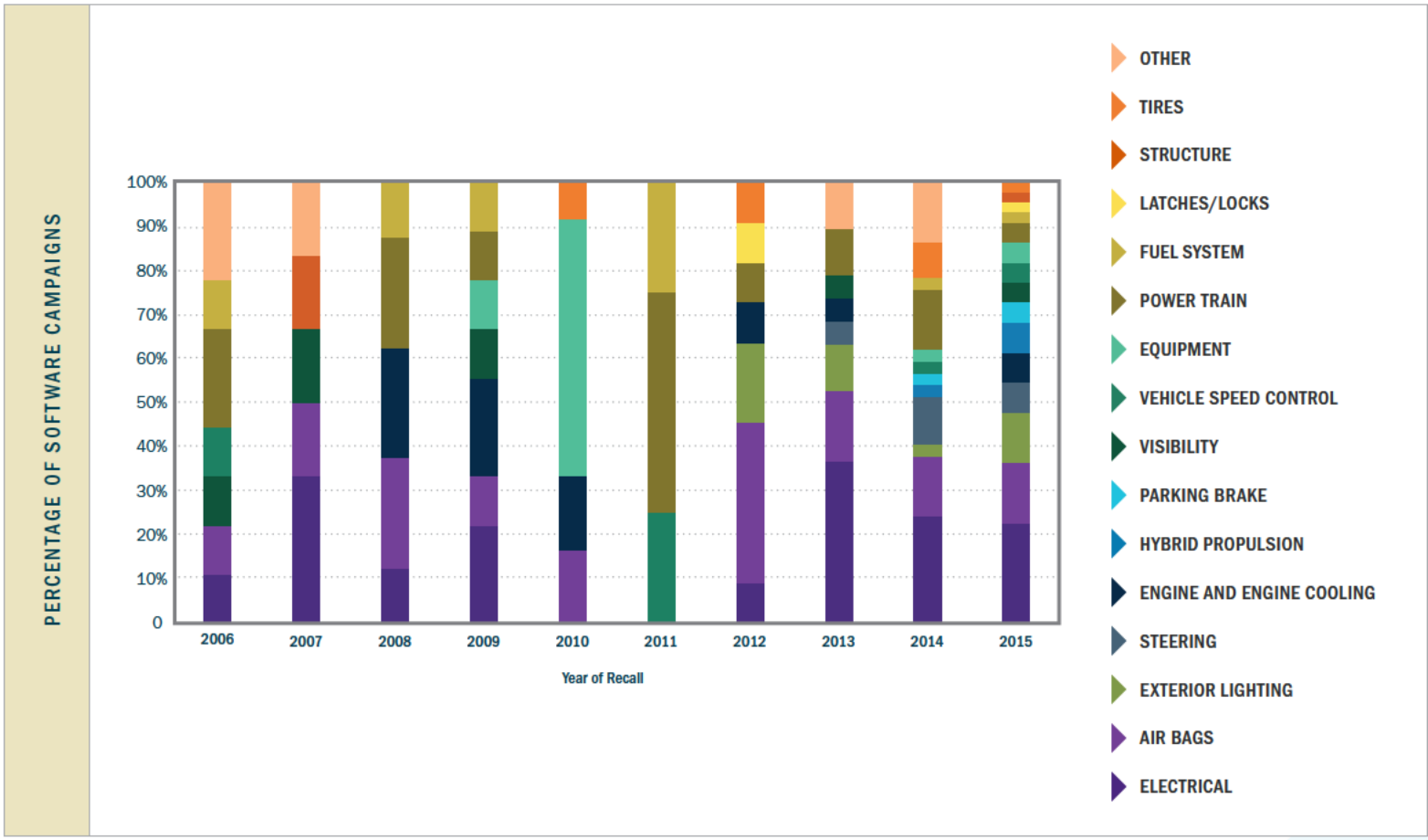
Over the years, more and more components rely on an automobile's internal computers instead of traditional analog systems. Such components include fuel mixture management, automatic braking, air bag sensors, and seats that detect the driver's weight and position. All have the potential to fail.

In 2011 only three software-related components were involved in recalls. In 2015, 20 components were affected by software-related recalls.

20 Number of component groups affected by software-related recalls in 2015

SUMMARY OF SOFTWARE-RELATED RECALLS BY YEAR AND COMPONENT PART

LAST 10 YEARS

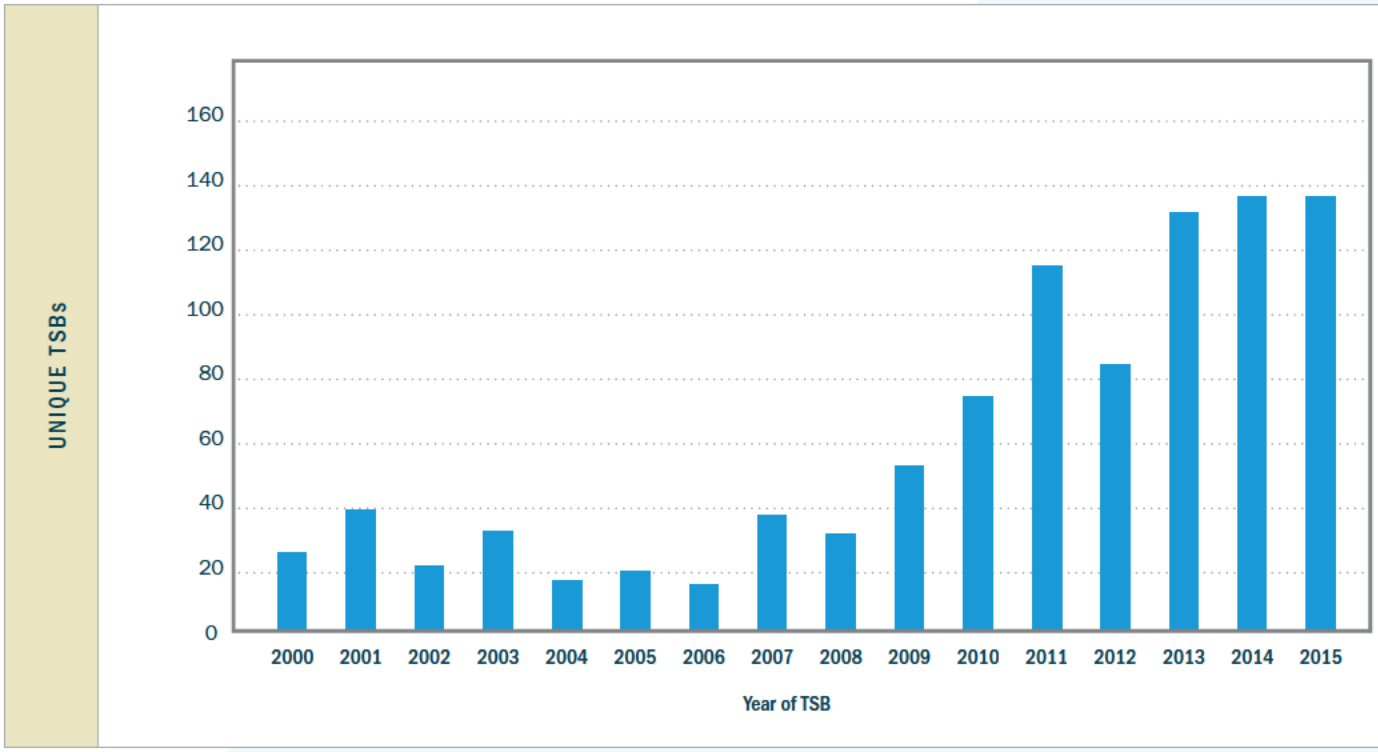


Includes BMW, Daimler, FCA, Ford, GM, Honda, Hyundai, Isuzu, Kia, Mazda, Mitsubishi, Nissan, Subaru, Tata Motors, Tesla, Toyota, Volkswagen and Volvo. Contains data through December 2015.

In addition, SRR discovered an increase in software-related Technical Service Bulletins (TSB), which identify issues with specific components, yet stop short of a recall. TSBs are issued when manufacturers provide recommended procedures to dealerships' service departments for fixing problematic components.

SUMMARY OF TECHNICAL SERVICE BULLETIN TRENDS

SUMMARY OF SOFTWARE TSBS BY YEAR (LAST 10 YEARS)



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EARLY WARNING STATISTICS

As the industry progresses toward more complex and connected vehicles, NHTSA is trying to keep up. One indication of this is the addition of several advanced technology categories added to the agency's NHTSA's Early Warning Reporting (EWR). The agency requires that motor vehicle and equipment manufacturers provide quarterly early warning data, including:

- **Production information**
- **Statistics on incidents involving death or injury**
- **Aggregate data on property damage claims, consumer complaints, warranty claims and field reports**
- **Copies of field reports (other than dealer reports and product evaluation reports) involving specified vehicle components, a fire or a rollover**

NHTSA has added several component categories for EWR reporting, including forward collision avoidance and automatic brake controls. According to the Insurance Institute for Highway Safety (IIHS), autonomous collision avoidance technology is being offered by as many as 22 OEMs as of January 2016.

35 In billions, the estimated cost of savings for automakers for over-the-air software updates in 2022

In 2015, three new software-related categories reported data for the first time:

- **Automatic Braking, listed on 21 EWR reports, resulting in 26 injuries and 1 fatality**
- **Electronic Stability, listed on 6 EWR reports, resulting in 7 injuries and 1 fatality**
- **Forward Collision Avoidance, listed in 1 EWR report, resulting in 1 injury and no fatalities**

It's clear that NHTSA is focusing its attention on this area, and it's worth watching to see how OEMs and the agency respond.

WHEN SAFETY AND TECHNOLOGY COLLIDE

Technology is a differentiator when vehicles go to market, often allowing automakers to charge more for increased connectivity, convenience and, in some cases, safety. However, the intense pressure to get vehicles with the latest technologies to market can affect the relationship between OEMs and suppliers—particularly if an automaker wants to move forward before a supplier believes software in a component has been fully tested.

The most publicized technological advancement in the auto industry has been the development of partially or fully autonomous vehicles that are designed to prevent accidents and injuries and death. Interestingly, NHTSA has said the artificial intelligence system piloting a self-driving Google car could be considered the driver under federal law, according to Reuters. The legal ramifications of this decision for OEMs and suppliers remains to be seen.

Connected vehicles also have received significant interest, primarily because drivers can do a number of things they never thought possible with Wi-Fi streaming. In addition, Wi-Fi could allow OEMs to make remote over-the-air (OTA) software updates.

Already Tesla has delivered software reports to its Model S cars, allowing owners to download updates via a cellular connection or Wi-Fi. Tesla has joined others – including BMW, VW, Hyundai and Ford – that have started to, or soon will, update navigation maps via OTA.

A report released last year from IHS Automotive predicted that over-the-air (OTA) software updates will soon be "a big boon for the automotive industry due to their capacity to reduce warranty costs, potentially increase overall completion rates for software-related recalls," and eliminate trips to the dealership, among other pluses.

The report estimated that worldwide OEM cost savings from OTA software updates would grow to $35 billion in 2022, "with telematics and infotainment system updates comprising most of the savings."

In addition, an OTA solution to recall repairs could dramatically increase completion rates as well as keep OEMs better connected with customers throughout their ownership of the vehicle.

“By the turn of the decade, every new car sold around the world will have data communications modules. It’s not just about infotainment. It’s more about the functionality of the vehicle.”

Jim Pisz, Toyota

“By the turn of the decade, every new car sold around the world will have data communications modules. It’s not just about infotainment. It’s more about the functionality of the vehicle,” said Jim Pisz, Corporate Manager of North American Business Strategy for Toyota, in *Digital Trends*. “It’s about the car telling the customer that it’s not feeling well before the customer knows. If a fault code comes up, it goes to a big data center and it’s noted as an exception. The information goes back to the dealer or back to the customer.”

The connected car phenomenon has a couple of potentially major complications, however – hacking and the exchange of private driver data information to OEMs. Most vehicles are “too old to be hacked” because the average automobile on the road is 11 years old, according to a *USA Today* story about the RSA computer security conference in March 2016. However, that’s going to change in years to come as prospective buyers – especially Millennials, who expect constant connectivity – demand more and better technology. Federal lawmakers and regulators are watching this issue closely.

Last year, U.S. Senators Ed Markey and Richard Blumenthal introduced the Security and Privacy in Your Car Act of 2015 (SPY Car Act), which required standards of protection against hacking and restricted data collected by vehicles. NHTSA would develop the standards and would be able to fine OEMs up to $100,000 for each violation of unauthorized access to vehicle data.

NHTSA has devoted a lot of attention to vehicle cybersecurity over the years. For example, *Consumer Reports* visited an NHTSA lab in Ohio where “a team of engineers spends their days hacking into vehicles.” The conclusion was that the only hacks that have been successful required physical access to a vehicle.

Automakers are sharing information as well, announcing the formation last year of the Information Sharing and Analysis Center (ISAC). The automotive ISAC plans to “act as a central hub for gathering intelligence that allows us to analyze, share and track cyber threats and spot potential weaknesses in vehicle electronics,” said ISAC Chair Tom Stricker, Vice President, Technical and Regulatory Affairs and Energy and Environmental Research, Toyota Motor Sales, North America Inc.

The degree of testing by OEMs and suppliers is extraordinary, and more sophisticated than many people realize. However, every eventuality cannot be anticipated. So it is incumbent upon automakers to figure out how to keep drivers safe when software-based components wear down or become compromised as vehicles age.

One idea is for OEMs to work through their dealers to offer an inspection – and potential update – of in-car technology every three years or so. However, it’s not clear how often OEMs should be monitoring technology, or whether ongoing OTA repairs would be enough to prevent future component failures.

FINANCIAL: SUPPLIER CONCERNS ON THE HORIZON

"Thanks to a well-timed coincidence of rising sales, falling warranty costs, rising reliability, and reduced recalls, the top two passenger car and light truck makers in Detroit are cutting their warranty expenses to just a few hundred dollars per vehicle sold."

Eric Arnum, *Warranty Week*

Despite the record number of recalls in 2014 and 2015, there was not a similar increase in warranty and recall-related financial accruals for General Motors, Ford and other major automakers last year. In fact, both GM and Ford reported lower levels of accrual, raising questions in the industry about how automakers are adjusting their accounting for increased recall costs.

In its Form 10-K for the period ended December 31, 2015, GM described why and how it started accruing a year earlier for costs associated with repairs and courtesy transportation for vehicles subject to recalls.

"We had historically accrued estimated costs related to recall campaigns in GMNA when probable and reasonably estimable, which typically occurs once it is determined a specific recall campaign is needed and announced," GM stated.

The first year of the recall accrual pushed GM's total for 2014 to about $5.45 billion, according to *Warranty Week*. In 2015, however, GM's total accrual was about $3.3 billion, very similar to 2013. Specifically, the recall accrual expense for the first nine months of 2015 was $685 million, down sharply from $2.658 billion in the same period in 2014, according to the publication. Ford's was $2.05 billion in 2015, about 3 percent lower than in 2014.

In addition, last year was a record for new car sales at 17.47 million vehicles, topping the previous record of 17.35 million in 2000. What this means is that, as reported by *Warranty Week*, for GM and Ford, 2015 actually represents the lowest warranty cost expectations since at least 2002, **on a per-vehicle basis**. While warranty costs are increasing overall, on a per-vehicle basis they may actually be declining. This may be due to increased vehicle volumes, excess accruals in prior periods and reduced per-repair costs.

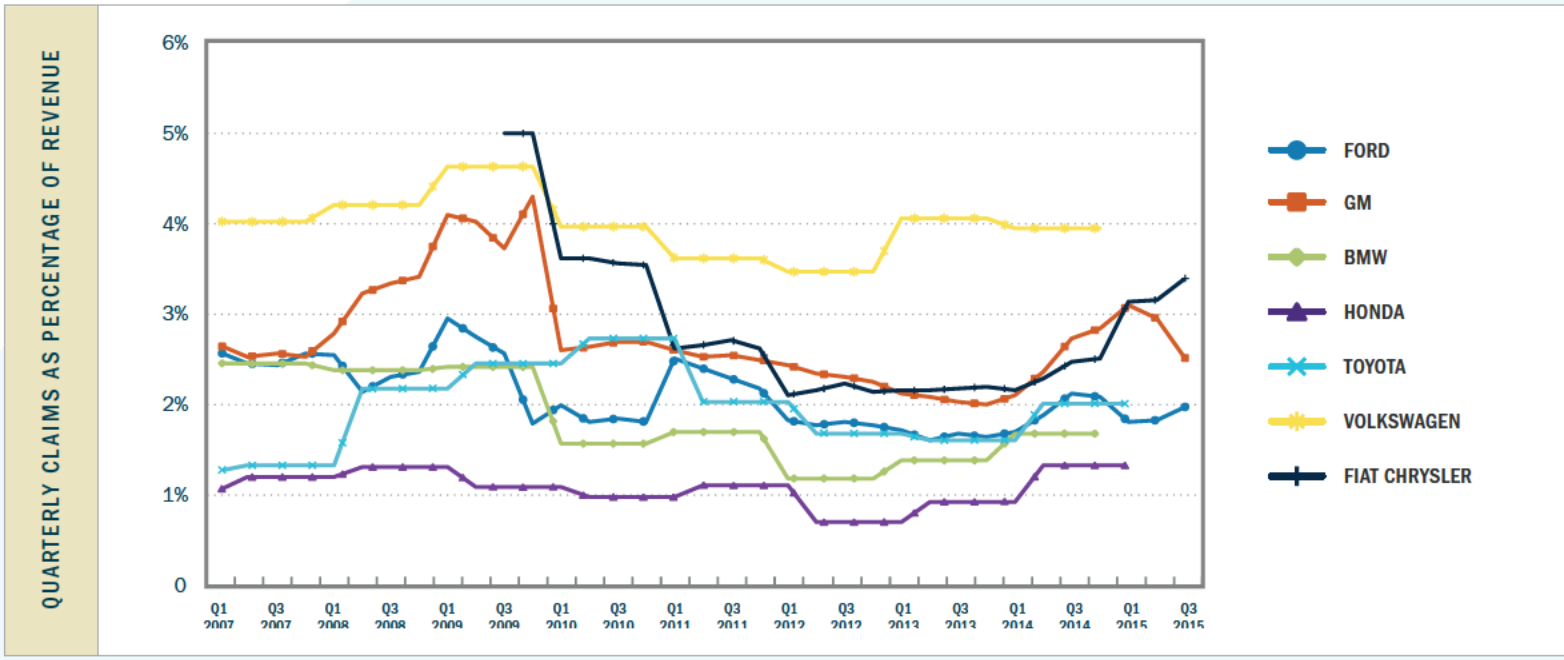
For example, many software repairs require a simple flash update. As such, even if the numbers of those increase significantly, costs may not.

17.47 In millions, the number of new cars sold in 2015, a new record

Overall, as indicated by this chart, most automakers are at, or just below or above, the 2 percent mark for quarterly claims as a percentage of revenue.

As in past years, there is limited transparency in the estimation and measurement of recall-related costs. It still remains to be seen if OEMs will change their accrual practices to match the elevated number of recalls expected to continue for the near future.

QUARTERLY CLAIMS / REVENUE



Source: Warranty Week

IMPLICATIONS FOR SUPPLIERS

Cost recovery actions from OEMs will be a constant concern for suppliers in 2016. The fallout from the last two years of record recall numbers has not fully hit suppliers financially.

Yet an important statistic found in 2014 continued in 2015: Suppliers are being named more often in Part 573 Reports. For each recall initiated, OEMs are required to submit a Part 573 Report that serves as notification to federal regulators that there is a defect related to motor vehicle safety or noncompliance with Federal Motor Vehicle Safety Standards. Required sections of the report include:

- **Manufacturer, designated agent and other chain of distribution information**
- **Identification of the recall population and its size**
- **Description of the defect or noncompliance and chronology of events**
- **The remedy program and its schedule**
- **Manufacturer of the defective component**

SRR researched all recalls dating back to January 2000 and reviewed disclosures provided to NHTSA by OEMs to identify suppliers.

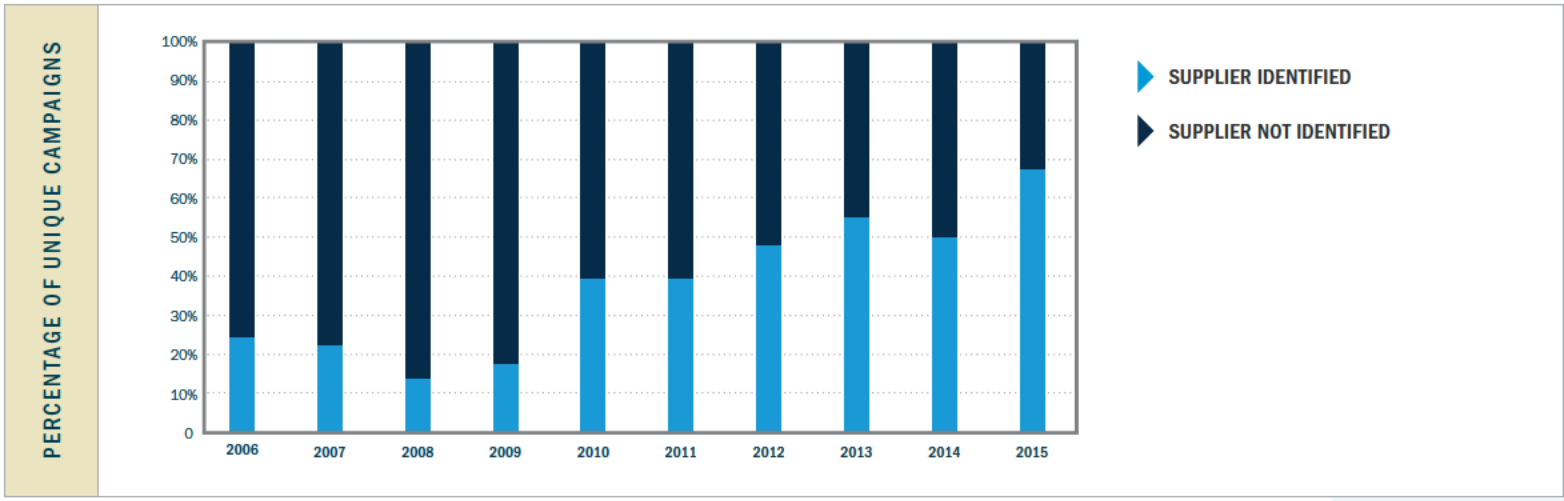
SRR then:

- **Consolidated and combined supplier subsidiaries and divisions**
- **Linked supplier information to the NHTSA Recall Database**
- **Analyzed component groups for which suppliers are most often named**
- **Evaluated recall trends by supplier involved**
- **Examined a population of about 2,500 recalls from 2000 – 2015 and classified them based on whether the defect was design-related, manufacturing-related, labeling-related, or unknown.**

SRR's investigation shows there is a significantly higher chance that suppliers will be named by OEMs now than in past years. For example, data shows that suppliers were identified in almost 70 percent of recalls in 2015, far more than the 15 percent noted in 2008.

SUMMARY OF RECALL TRENDS

RECALLS WITH IDENTIFIED SUPPLIERS - UNIQUE CAMPAIGNS



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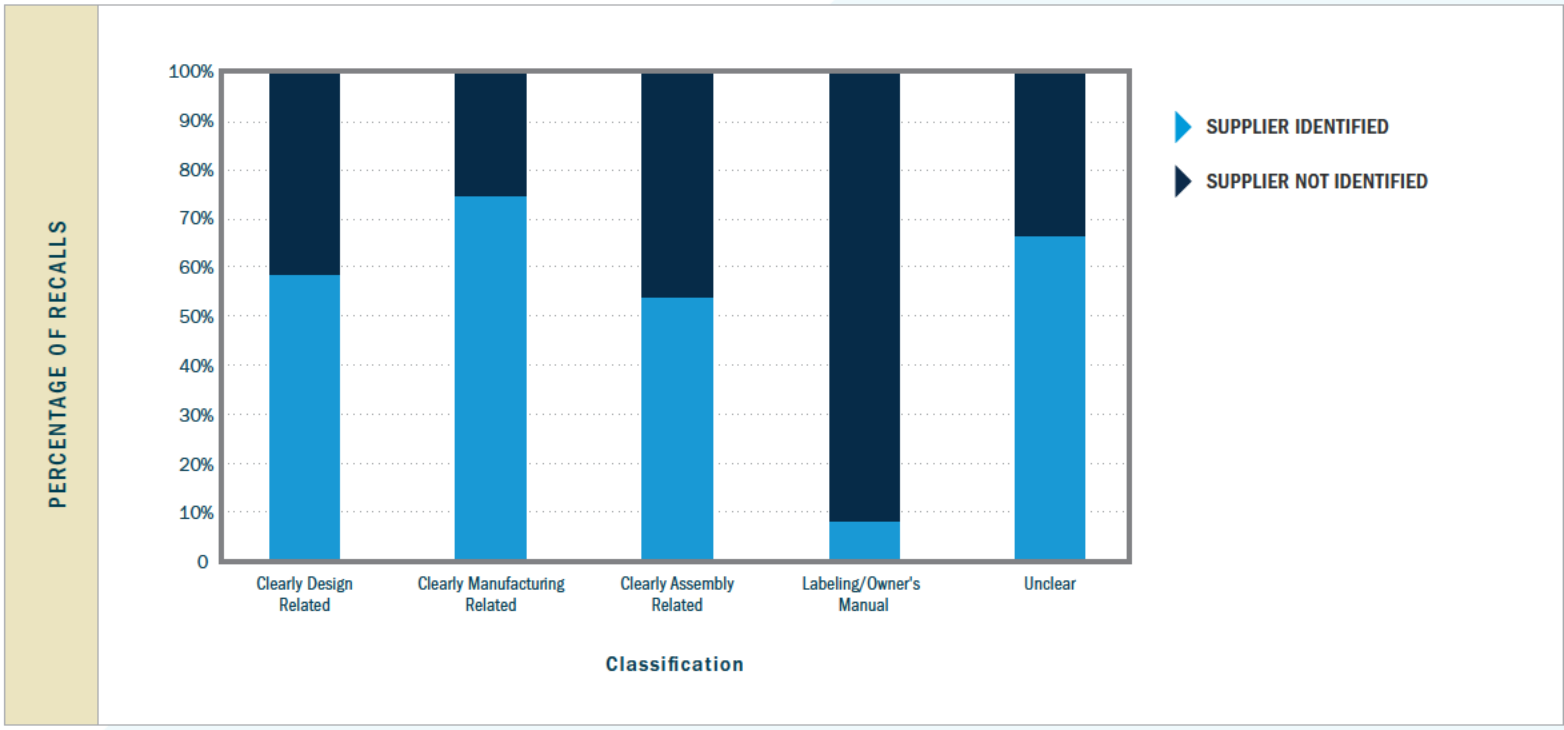
Another data analysis set clearly shows that not all recalls have the same impact on suppliers. If a recall is related to the manufacturing of the product, suppliers are more likely to be named in the 573 Report. However, a supplier's name is less likely to be revealed if the recall was design-related or associated with the assembly.

With more suppliers becoming involved in the design and assembly of components, they need to realize that their financial exposure through cost recovery actions by OEMs could increase as a result.

RECALL CLASSIFICATION BY SUPPLIER IDENTIFIED OR NOT IDENTIFIED

FOR SELECTED RECALLS FROM 2011 - 2015



CONCLUSION

If 2015 was a year of conflict among regulators and automakers, this year could see the beginning of a closer relationship between the two parties.

OEMs realize that regulators are serious about making sure automakers follow the rules. NHTSA knows it can get more cooperation by working directly with companies to solve stubborn problems such as completion rates and cybersecurity.

The most important test of that relationship will be completion rates. Recalls continue to increase year-over-year -- both in actual recall campaigns and total number of units – and regulators expect to see more progress toward their 100-percent completion goal.

Improving on completion rates will require new approaches, such as personalizing communication with owners. In their marketing campaigns, automakers take great pains to research their target audiences and provide communications that motivate them to action. Their recall campaigns ought to do the same.

Another issue to watch is the continued growth in autonomous and semiautonomous vehicles, which are almost certain to have imperfections, the implications of which are still unknown. The potential for new safety issues is something to which automakers must be particularly attuned.

Suppliers that help OEMs get the newest software-aided components to market should be prepared for the increased financial exposure they could face if these parts fail.

The struggle between feeding the consumer's need for technologically advanced vehicles and making sure every part has been tested to its fullest will continue in this highly competitive industry. Manufacturers need to plan ahead so they can mitigate the damage caused by recalls on components that, no matter how technically advanced, might not perform as expected.

As automobiles become more complex, so do the regulatory and financial implications for the automotive industry. This report, and the additional analysis we continue to undertake, will provide insights to help the industry get a better view of the road ahead.

ABOUT SRR

SRR AUTOMOTIVE PRACTICE

SRR was founded in Detroit 25 years ago, so our automotive roots run deep. The depth and breadth of our experience in the automotive industry, combined with unparalleled expertise and experience in Valuation & Financial Opinions, Investment Banking, and Dispute Advisory & Forensic Services results in a uniquely valuable collection of knowledge regarding industry practices, internal reporting systems, common and uncommon documentation, industry trends and milestones and other information that is simply not known unless you live and breathe the automotive industry. SRR professionals have more automotive experience in these service areas than any other advisory firm, period.

CLIENTS

- $60MM supplier of noise-reduction & vibration-dampening products
- $500MM manufacturer of die cast engine & transmission components
- $100MM supplier of exterior lighting systems
- $10MM supplier of precision underhood stampings
- $10MM manufacturer of transmission components
- $25MM piston pin manufacturer
- $150MM supplier of stamped engine, transmission & chassis components
- $160MM automotive camshaft manufacturer

UNPARALLELED INDUSTRY FOCUS, EXPERIENCE, AND CAPABILITIES

- Extensive experience in the automotive industry includes providing Valuation & Financial Opinions, Investment Banking, and Dispute Advisory & Forensic Services to OEMs, suppliers, material providers, vendors, lenders and dealers worldwide.
- Recognized nationally and internationally with respect to depth of automotive industry knowledge and expertise. As a result, SRR professionals maintain personal relationships with key industry participants and are involved in leadership roles in industry associations and organizations.
- Hundreds of automotive engagements completed annually.
- Broad based industry experience as well as niche segment experience such as stamping, plastics, metal forming, dealerships, and distressed companies.
- Experience across nearly every vehicle segment, encompassing original equipment manufacturers all the way through the supply chain.
- Experience in numerous significant transactions involving the valuation of automotive related assets throughout the U.S. and worldwide for various transaction advisory, financial reporting, tax, and other corporate related matters.
- Assessed damages in patent infringement cases involving the varied technologies in the automotive industry such as airbags, steering components, visibility components and aftermarket components.
- Recognized experts in the automotive industry providing expert testimony regarding valuation and damages in a wide variety of matters such as contract disputes and economic damages, shareholder disputes, forensic accounting and internal investigations, and antitrust investigations, as well as providing e-discovery and data hosting services in the context of litigation.
- Involved in hundreds of engagements related to valuation of patents and other intellectual property for various financial reporting, tax, and other litigation-related matters.
- Strategic senior level experience in private market financings including transactions, growth capital, and shareholder recapitalizations.
- Extensive relationships with senior and mezzanine lenders and equity investors.
- Approximately 350 professionals in twelve offices including Atlanta, Baltimore, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Los Angeles, New York, Tysons Corner, and Washington, D.C.

$40MM supplier of stamped metal components

$175MM exhaust system component supplier

$50MM producer of internal electronic controls

$11MM manufacturer of electronics & electromechanical controls

$15MM producer of screw machine parts & subassemblies

$12MM manufacturer of plastic HVAC & fuel system components

$70MM manufacturer of aluminum wheels

$160MM manufacturer of precision machined powertrain components

WARRANTY AND RECALL RISK ASSESSMENT SERVICES FOR AUTOMOTIVE OEMS AND SUPPLIERS:

WHAT WE DO:

- Analyze warranty and recall data collection systems, warranty repair history, administrative processes and costs, recall risks and costs, alternate recall procedures, and other information
- Analyze warranty and recall circumstances of many sizes – from large recalls affecting millions of vehicles to small recalls or extended warranty actions affecting several thousand vehicles
- Analyses are used to assist clients in understanding the risk and economic costs of warranty service repair, recall campaigns and other actions for purposes of business negotiation, claim assessment, or settlement and trial testimony

HOW WE DO IT:

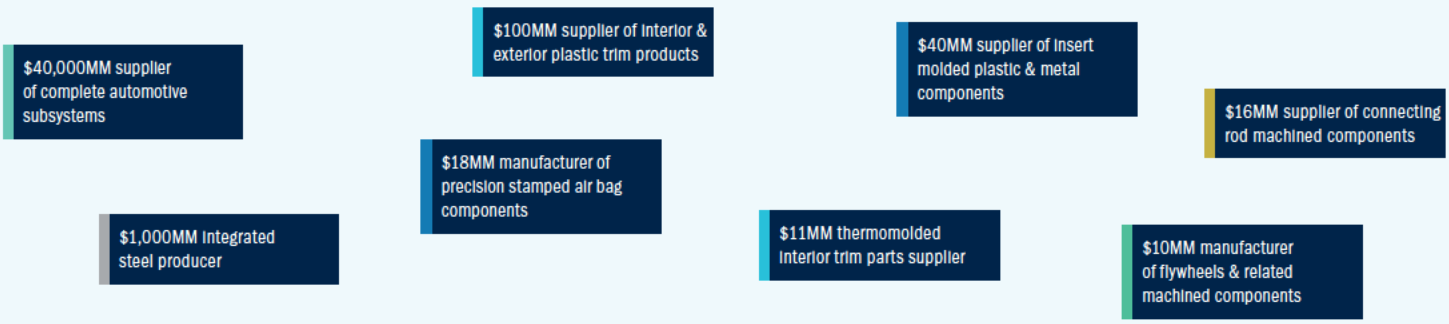
- Expertise in understanding potential warranty and recall activities and the costs associated with each
- Traditional and creative approaches employed in assessing risk from multiple perspectives, as appropriate
- Wherever possible, our analyses make use of supplier and program-specific information to further refine and support our analysis
- Warranty and recall risk is often nuanced, and not easily represented by a simple mathematical or actuarial calculations
- We apply both quantitative and qualitative risk factors impacting warranty and recall risk
- We identify likely warranty and recall scenarios and establish cost and risk parameters for each

CLIENTS

- $19MM supplier of bearing products
- $20MM manufacturer of seat hardware systems
- $11,800MM supplier of electrical systems & components
- $40MM supplier of rubber window seals
- $1,000MM supplier of precision machined components
- $235MM body & suspension components supplier
- $120MM supplier of cold headed fasteners
- $30MM supplier of vehicle body hardware & other components

About the Author

NEIL STEINKAMP is a Managing Director at SRR. He has extensive experience in providing a broad range of business and financial advice to corporate executives, risk managers, in-house counsel and trial lawyers. Steinkamp has provided consulting services and has been engaged as an expert in numerous matters involving automotive warranty and recall costs. His practice also includes consulting services for automotive OEMs, suppliers and their advisors regarding valuation, transactions and disputes. Mr. Steinkamp can be reached at +1.646.807.4229 or nsteinkamp@srr.com.



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