Anniversaries, in my view, are not a measure of time. Anniversaries measure commitment. I’m proud of the 25-year commitment CCC has made to the industry through the publication of Crash Course.

The 2020 IT'S TIME edition provides insights about where we’ve been and about the key drivers shaping our future — AI, ADAS, driverless vehicles, data access, digital consumers, quality repairs, and more. Without question, the data clearly shows we are entering the most exciting time in our history.

I think back 25 years to 1995. Netscape, Windows 95 and Internet Explorer were being introduced, setting the foundation for the future of digital connections and communications. At the same time, CCC was launching a new digital platform to connect our industry in new and exciting ways. A byproduct of this digital transformation was the creation of roughly 10 times more data, providing more granularity and the foundation of deeper insight.

This transformation marked one of several key milestones in our company’s history. At that time, CCC decided to harness the power of, and invest in, data with the explicit purpose of advancing the industry and our customers. We organized around establishing clear practices and procedures to provide trustworthy and actionable information to customers, helping to improve operations and maintain differentiation in ways that had not been possible before.

This effort has been ongoing for 25 years, resulting in three core principles:

- Insights we deliver must be worthy of trust, predictable, and actionable.
- Great care is taken to be as free of confirmation bias as possible.
- Feedback from these insights is used to continuously improve the products and services we deliver to our customers.

Over the years, the depth and breadth of information has expanded, enabling the delivery of sufficiently high-confidence predictions, including driving data, mobile usage patterns, estimatics, parts, demographic data, total loss valuations, estimate audits and reviews, medical, and supply chain. Today, tens of millions of claims are routed based on a predictive view of the likely outcome in real time at first notice of loss and countless repairs are expedited through real-time connections and data flow. The time it takes to make decisions is shrinking.

At the same time, the possibilities of AI are increasing. Over the last five years, we have worked extensively to establish hundreds of models. AI at its core requires a massive amount of information to inform models, and its power can only be unleashed once integrated into real-time processes. Today, after years of investment, AI guides the front-line people who manage claims, conduct repairs, or interact with customers. By reducing time required to manage routine operations, people now have more time to deliver high-touch experiences that exceed customer expectations.

Our theme for Crash Course 2020 is ‘IT’S TIME,’ intended to draw attention to what is today uniquely possible by connecting various parts of the process and applying data-driven insights from upstream and downstream steps. It is also a testament to the people at CCC and our ongoing commitment to serve and connect our customers — insurers, repairers, OEMs, parts providers, fleets, rental companies, and more.

From our team of data scientists to our customer-care teams, to individuals like Susanna Gotsch — who has been at the helm of sharing insights through Crash Course for 25 years — CCC remains steadfast in our commitment to thoughtfully connect the industry and to empower what comes next.

We are proud to move forward with you and deeply appreciate the tremendous trust you place in us.
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Talk of the end of the auto industry as we know it continues, even as automakers produce products of unprecedented diversity in terms of body styles, engine propulsion, safety and comfort features.

We no longer talk just about automobiles; it’s all about personal mobility — whether that is by walking, biking, using a scooter, ride-share service, public transportation, or flying car. Change has come to how consumers purchase and use vehicles, and more change is coming.
With more consumers opting for alternative modes of mobility, the auto industry is facing a need to reinvent itself or face shrinking revenues. The cost to own and operate a vehicle, as well as the cost of wasted time, are some of the reasons why consumers are looking for alternatives. And today, more than ever, time is money. Time spent looking for a parking space, driving in bumper-to-bumper traffic, or driving a truck thousands of miles to transport goods is time that could be repurposed in the future. In this section of Crash Course, “Time is Money,” we will explore where we are on this continuum.

U.S. Auto Sales Slow, but Growth in Vehicles in Operation Continues

CY 2019 was the fifth consecutive year that U.S. new vehicle sales surpassed 17 million. Used vehicle sales were also strong, closing out the year with an estimated 40 million units sold (see Figure 1). CY 2019 new sales were down over one percent for the year, coming in at 17.1 million versus 17.3 million in CY 2018, and 17.5 million in CY 2016.1

Most analysts predict slower auto sales in the coming years, as slower job growth and consumer spending, pent-up demand and higher new vehicle prices are forcing consumers to forgo a vehicle purchase or purchase a used vehicle versus new. The growing popularity of larger, more expensive vehicles and new vehicle technology drove up the average new vehicle MSRP to over $35,000 in CY 2019, and many consumers opted for longer loan term lengths to afford a new vehicle.

Higher used-vehicle demand and larger volumes of clean late-model used vehicles also lifted the average used vehicle transaction price (see Figure 2). Through the first nine months of CY 2019, prices on vehicles aged eight years and newer were up 1.7 percent versus the same period in 2018.2 Analysts forecast used vehicle prices for vehicles aged eight years and newer will rise between 1 and 1.5 percent in 2020.3

Fewer passenger vehicle miles driven, as well as better-built vehicles, mean vehicles last longer than ever before; data from IHS Automotive reveals the average age of vehicles on the road in the U.S. was 11.8 years in CY 2019 (see Figure 3).4 The aging vehicle fleet over the last decade was driven largely by the addition of new vehicles that did not displace old vehicles that remain in the fleet despite being driven less (see Figure 4).5 The normal displacement of older cars by newer cars was slowed further during the Great Recession, leading to a larger number of older cars in use today.
With auto sales trending about 17 million annually, the overall vehicle fleet continues to grow at about 2 percent annually (see Figure 5). As overall vehicle quality improved, vehicle scrappage rates remained low, leading to a slow turnover of the overall U.S. vehicle fleet and older fleet. Growth in overall vehicles in operation is a key driver of steady growth in the collision repair industry, countering more recent slowdown in auto claim frequency.

IHS Automotive Average Age of Vehicles in Operation in the U.S. CY2002-CY2019

(FIGURE 3) | SOURCE: IHS AUTOMOTIVE

<table>
<thead>
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<th>Year</th>
<th>Average Age Car</th>
<th>Average Age Light Truck</th>
<th>Average Age Total</th>
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<tr>
<td>2019</td>
<td>15.8</td>
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</table>

Average Annual VMT for 1-Year-Old, 10-Year-Old, and 20-Year-Old Vehicles in CY2017

(FIGURE 4) | SOURCE: SAFE ANALYSIS BASED ON DATA FROM 2017 NHTS. HTTP://ENERGYFUSE.ORG/ARE-AMERICANS-DRIVING-OLDER-CARS-OR-JUST-LEAVING-THEM-IN-THE-DRIVEWAY/

- 1-Year Old: 14,000
- 10-Year Old: 12,000
- 20-Year Old: 8,000

Headwinds for Industry “ACES” in 2020 and Beyond

Looking to CY 2020 and beyond, the auto industry is facing some headwinds. Much uncertainty remains in place regarding tariffs and regulations — and uncertainty about the outcome of the 2020 presidential election certainly doesn’t help. Shifting demographics and consumer expectations require companies to be nimble, but not only in product development, but also in the concepts brought to market and how they are marketed. As vehicles become more expensive but last longer than ever, new vehicle sales will slow, and automakers will explore new revenue streams in order to recreate themselves as personal mobility companies as opposed to simply car companies.

In their efforts to do so, automakers continue to invest huge amounts of money in the four megatrends “ACES” — autonomy, connected car, electrification and shared. Growing acceptance of just how hard it is to develop a fully autonomous vehicle and the economic feasibility of operating a shared vehicle fleet have resulted in many automakers increasing their focus on electrification and connected car.
Automakers face greater uncertainty now than they have in more than 100 years.

This is an industry that has seen a lot. A couple of world wars. The Great Depression. The Great Recession. Labor strife. Oil embargoes. But now it faces technological changes that threaten to obsolete all the infrastructure and intellectual property they’ve invested in.”

John McElroy


Electric Vehicles Charge Ahead

Demand for electric vehicles is driven largely by regulations to curb emissions in China and the EU. LMC Automotive projects sales of battery-powered vehicles will quadruple by CY 2025 and account for 4.8 percent of the U.S. auto market versus just 1.3 percent today. And while electric vehicle sales have grown, they still represent a small percent of sales (see Figure 6). It wasn’t until mid-2018 that the U.S. market achieved the 1 million EV-mark, where each sale included at least $7,500 in tax incentives. With battery costs accounting for about one-third of their total cost, an electric vehicle’s sticker price is expected to remain thousands of dollars more than a comparable gas-fueled vehicle — a tough proposition for consumers despite potential for lower lifetime cost of ownership. Despite these challenges, automakers are forging ahead with new models at various price points. LMC Automotive predicts 110 models available for sale in the U.S. market alone by CY 2025. AlixPartners LP projects automakers will spend $225 billion to develop new electric-vehicle models over the next several years. Many are creating closer ties with battery companies to lower costs and secure future battery supplies — for example, GM with LG Chem; and Toyota with Panasonic.

Battery-electric vehicles as a share of region’s CY2018 light vehicle sales volume

Connected Vehicle Counts Grow

Demand for greater digital capability and wireless connectivity in the vehicle itself has led many automakers to introduce connected vehicle technology into their fleets. Through vehicle connectivity, or telematics, vehicle performance data is shared over the air to assess vehicle health; navigation and driving data can be used to assess vehicle acceleration, braking patterns, location and route history; data is shared for vehicle-to-vehicle and vehicle-to-infrastructure communication; emergency alerts can be generated in the case of an accident or emergency; and numerous services are streamed directly into the vehicle. Ford uses connected vehicle technology to help identify a vehicle’s features that passengers do not interact with, and subsequently removes those features in later models to help improve overall vehicle affordability. Telematics can be either a factory/OEM embedded system, a consumer electronics device such as a smartphone, an aftermarket telematics control unit (dongle that plugs into the on-board diagnostics port), or a hybrid device that includes an embedded telematics control unit and a consumer electronics device. Today, connectivity via a smartphone accounts for approximately 50 percent of the market, but embedded systems are rapidly being brought to market. According to March CY 2019 data from Statista, there were 49.7 million connected cars with embedded systems in the U.S. in CY 2019, up from 29.3 million in CY 2017 (see Figure 7).
Connected Car U.S. Stock and Percent of Households with Connected Car


Car-Sharing Services Reset

Car-sharing services also saw a great deal of activity in CY 2019. BMW Group merged its urban mobility services with Daimler AG’s Car2Go, grouping the numerous services offered to their 60 million users under five new ventures: Reach Now, Charge Now, Park Now, Free Now, and Share Now.23 Essentially the 36 million car-sharing users would only be 0.4 percent of the global population, which the U.N. anticipates will reach 8.1 billion by 2025.22 While that represents impressive growth, it is still small compared to the overall global population which the U.N. anticipates will reach 8.1 billion by CY 2025.22

A survey of 10,000 respondents from the U.S., China, France, Germany and the U.K. conducted by OC&C Strategy Consultants found car-sharing, short-term renting, and taxis are unappealing to consumers in most Western countries because they want a vehicle “when and where they need it” and it’s too much of a hassle to pick up a vehicle.20

In CY 2016, Frost & Sullivan predicted the number of car-sharing users globally would grow from 10 million in CY 2017 to 36 million by CY 2025.21 While that represents impressive growth, it is still small compared to the overall global population which the U.N. anticipates will reach 8.1 billion by CY 2025.22 Essentially the 36 million car-sharing users would only be 0.4 percent of the global population. Poland’s state-owned public power company now is an investor in the car sharing services company4Mobiility, and there is speculation now that power companies and other companies in the oil and gas industries may look to make future investments in car-sharing services, particularly with the emergence of electric vehicle fleets.24 Expect car-sharing to develop further in the coming years.

“Not in My Lifetime”

In CY 2019, many of the technology and car companies working on the development of autonomous vehicles (AV) acknowledged publicly just how difficult the development of a fully autonomous (Level 5) vehicle truly is.

I stepped way back [on] this idea of Level 5. I’ve really given up. I don’t even know if that will happen in my lifetime.”

Steve Wozniak
Co-founder Apple Inc.


Daimler chairman Ola Källenius, Waymo chief executive John Krafcik, Honda CEO Takahiro Hachigo, and Steve Wozniak, the co-founder of Apple Inc., have made public statements about their tempered expectations. While many prognosticators had predicted the arrival of Level 4 and Level 5 autonomy by CY 2025, there’s a growing realization that these goals may be more difficult to achieve than previously thought.

The reality is that driving is a social process that involves numerous complex interactions with other drivers, pedestrians, cyclists, and all types of changing road conditions.25 Common sense and generalized knowledge are relied upon in many everyday traffic situations — things very difficult for a software program or even AI to mimic. Today it’s estimated that the companies developing autonomous vehicle technology have developed 80 percent of needed technology to put self-driving vehicles into routine use; but the remaining 20 percent (referred to as ‘corner cases’) could reliably anticipate what other drivers, pedestrians and cyclists are going to do is much more difficult.26 Other situations such as knowing not to follow a vehicle too closely if it looks like it’s looking for a parking spot (an example of a ‘micro maneuver’) are also very hard to program around.27 Add the challenges inherent in having AVs driven alongside manually driven vehicles for many years to come, and the timeframes potentially extend further. There are nearly 300 million vehicles on the road in the U.S. today alone with an average age of 11.8 years, so roads will be shared for quite some time.
Ultimately, one of the challenges of self-driving is that you’re trying to predict human behavior, and human behavior tends to not fall into rational agent models. Real-world data already shows consumers don’t clearly understand how the various advanced driver assistance systems (ADAS) work — essentially the building blocks to full vehicle autonomy. The range in capabilities, implementation, and feature names used across the OEs for the various ADAS technology certainly doesn’t help. The fact that most of these systems are considered Level 1 or Level 2 per the SAE autonomous vehicle definitions speaks to increasing challenges ahead. A study conducted by the Insurance Institute for Highway Safety (IIHS) surveyed more than 2000 drivers on five Level 2 systems available at that time. The study found the feature names alone can lead to misunderstandings about the technology’s capability. In its ongoing investigations of vehicle crashes that included ADAS, the National Transportation Safety Board (NTSB) examined and identified the role of automation complacency — where overreliance on driver-assistance systems led to driver inattention. Finally a study from the AAA Foundation for Traffic Safety assessed people’s understanding of AV technology, their expectations and concerns about AVs and their rationales behind their distrust and discomfort toward AVs. The study found people perceived higher levels of vehicle automation as more effective in preventing crashes related to specific driving behaviors and situations, but concern increased as levels of automation increased due to unfamiliarity with the technology and perceived unreliability of it.

Many challenges remain before automakers can address every potential accident scenario, at all traveling speeds and in a consistent manner. And this is just the technology; how each driver responds to the technology will vary as well, with three key challenges of mode confusion, role confusion, and misplaced trust likely to further complicate the path towards full vehicle autonomy.

To date, there are no clear regulations at the state or federal level governing the safety testing and deployment of autonomous vehicles. In October 2019 41 states had enacted legislation or signed executive orders regulating the testing and use of autonomous vehicles, and in September NHTSA released new federal guidelines, but they are only voluntary. After their investigation into the Uber autonomous test car that killed a pedestrian in Tempe, Arizona, in March CY 2018, the NTSB called out NHTSA for not providing enough direction to autonomous vehicle development.

Despite New Mobility Alternatives People Still Drive

Among the numerous indicators that prognosticators pointed to when arguing that the era of personal vehicle ownership was coming to an end was a decline in the share of individuals getting their license, buying a vehicle, and a decline in overall miles driven. All of these declines did happen, but the reasons why may be more nuanced than originally thought.

Yet more money and effort continue to be invested in AVs. More companies announced partnerships around autonomous vehicle development, in part to offset the billions of dollars being spent on AV research and development, but also to pool resources: VW and Ford invested jointly in Argo AI; Honda invested in Cruise, GM’s autonomous vehicle operations; Mercedes and BMW agreed to work together; FCA and JLR are working with Waymo; and Toyota and Volvo are working with Uber. Autonomous logistics focus on the ‘last-mile’ has seen increased investment, with FedEx, Ford and Domino’s, Kroger and others looking to solve the challenge of delivering goods at the last mile, which is estimated to be nearly a third of an item’s total delivery cost.

While the timeline has been pushed out, the advances being made in sensor, camera, lidar, radar, AI, software, infrared cameras and sensors, cybersecurity and other technologies continue, suggesting AVs are inevitable — it’s just a question of when.

And while fully autonomous vehicles are presented as the best way to get to zero road fatalities and accidents, they’re unlikely to be the only way to get us there. Research from the Casualty Actuarial Society of the National Motor Vehicle Crash Causation Survey concluded that driverless vehicles would potentially address only 78 percent (not 93 percent) of accidents if they could not overcome weather, vehicle errors and inoperable traffic control devices. So far, the best ADAS system developed for hail is the garage.
Maybe They’re Not So Different After All

One of the key reasons people were predicting the end of personal vehicle ownership and a shift to alternate modes was the large decline in licensed driver data among the younger age groups. This was a clear sign that the millennial generation had much less interest in vehicle ownership than prior generations. Subsequent analysis suggests that there are additional or alternative reasons for lower licensing levels among younger generations. Several of these studies are discussed below.

One study comes from the Board of Governors of the Federal Reserve System. This study compared the socioeconomic and demographic characteristics of Millennials versus prior generations. Accounting for their age and other factors, such as differences in income, saving, and consumption, this study found Millennials don’t appear to have preferences for consumption that differ significantly from those of earlier generations.41 A second study by Christopher R. Knittel and Elizabeth Murphy, “Generational Trends in Vehicle Ownership and Use: Are Millennials Any Different?” found similar results. When differences in age, income and other demographics were controlled for versus prior generations, their research revealed that Millennials don’t own fewer vehicles, and actually drive more miles per year than Baby Boomers (see Figure 10).42 It is worth noting that Millennials accounted for nearly half of U.S. home-mortgage originations as of December 2019.43

Millennials Have Similar VMT and Vehicle Ownership After All (FIGURE 10)

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 Millennials Have Similar VMT and Vehicle Ownership After All (FIGURE 12)

NBER study of Millennials’ vehicle decisions and whether they differ from those of previous generations.

Focus on two main facets of personal mobility:

1. Vehicle ownership, measured by how many vehicles a given household owns.

2. Vehicle usage, measured by annual vehicle miles traveled (VMT).

Control for demographic and macroeconomic variables such as income, household size, location, education, sex, race, marital status, number of children, etc.

Conclusions

1. Results confirm Millennials’ observed decrease in vehicle ownership & VMT arises from differences in demographics.

2. When Millennials & Baby Boomers with similar demographics are compared, Millennials have higher ownership rates & VMT.

3. Millennials are altering life-choices that affect vehicle ownership.

4. However, the net effect of these endogenous choices is to reduce vehicle ownership by less than one percent (with effects larger than two percent statistically ruled out).

Finally, a third study further combats the theory that generational differences are driving change in vehicle miles traveled, showing instead that changes in miles driven are impacted most by economic factors. The Insurance Information Institute analysis of a study in the Energy Journal titled “Explaining the Evolution of Passenger Vehicle Miles Traveled in the United

At the same time, the percentage of households living car-free continues to hover just below 10 percent. Data for CY 2018 from the American Community Survey’s “Household Size by Number of Vehicles Available” reveals only 8.5 percent of households in the U.S. were car-free, versus 14.2 percent for one-car families; 18.3 percent for one-car one-singles; and 58.9 percent for more than two cars.40 This last category includes all households with two or more vehicles — including single households, where a surprisingly large percentage own more than one vehicle — specifically 16 percent of singles and 4.5 percent of all households in CY 2018.40
States’ highlighted the study’s conclusion that it was changes in demographics and economic characteristics, rather than changes in household driving habits that largely explain changes in VMT [vehicle miles traveled] between CY 1995 and CY 2015.44 The study also predicts the average annual VMT growth rate from CY 2015 to CY 2025 would be 0.9 percent, based on the opposing factors of rising income (which increases VMT) and aging population (which decreases VMT).

Overall miles driven in the U.S. continued to grow in CY 2019. For the rolling 12-month period ending October CY 2019, miles driven are up 1.0 percent versus the prior period, versus only 0.4 percent for full year CY 2018 (see Figure 11). Fewer than a third of individual states saw a decline in miles driven between CY 2018 and CY 2019 (see Figure 12), and most of those states saw lower rates of population growth over the last decade (see Figure 13).

Yet a key proxy for vehicle accident exposure is how many miles an individual vehicle drives per year. Analysis of claims data shows the average annual miles per loss vehicle (as measured by the odometer of the loss vehicle divided by the vehicle age) continues to trend downward, except for the newest model year vehicles, after experiencing a big jump between CY 2013 and CY 2014 (see Figure 14). A higher share of individuals who work at home also is likely a culprit — the number of workers aged 16 years or older whose primary means of transportation to work was ‘worked at home’ grew from 3.6 percent in CY 2005 to 5.1 percent in CY 2017.45 Nearly 4 million U.S. employees worked from home at least half the time in 2015 — roughly 3 percent of the U.S. workforce, and a number that grew 115 percent between CY 2005 and CY 2015, and grew nearly 10 times faster than the rest of the workforce according to a study by Global Workforce Analytics and Flexjobs (see Figure 15).46

Percent Change in Miles Driven CY2019 through November versus Same Period Prior Year by State

Projected Growth: Census 2010—Census 2020

Source: William H. Frey Analysis of Census Bureau population estimates, released Dec 30, 2019 | Note: April 1, 2020 population is calculated by assuming that the growth rates from July 1, 2018 to July 1, 2019, reported in Census estimates, continues through April 1, 2020.
Is Growth in E-Commerce Changing the Makeup of Miles Driven?

People still buy cars but drive them less. Access to alternate methods of mobility are only part of the reason. People are spending more time than ever at home, streaming movies, ordering dinner in, telecommuting, and shopping online (see Figure 16). The explosive growth of online shopping has created an experience of significant convenience for consumers. Even consumers shopping for autos now do much of their preliminary shopping online. 61 percent of car shopping is now spent online, with 21 percent of that ultimately spent on the website of the dealer the vehicle is purchased from, and 60 percent of dealership website traffic now coming from mobile devices.47

The curb today in most American cities is overwhelmingly devoted to single-occupancy personal-vehicle parking, which is simply unsustainable.”

A United Parcel Service Inc. Spokesman

According to SJ Consulting Group, U.S. consumers will get 8.6 billion packages delivered domestically in 2019, up 150 percent from 2010.48 While some of this means fewer trips and miles overall, some of this results in a transfer of the mileage elsewhere — i.e., delivery services and ride-hailing services.

According to the ATA, U.S. trucks moved 10.8 billion tons of freight in CY 2017 — a number that equates to roughly 30 pounds of goods for every person in the U.S.49 In the 2019 Annual Energy Outlook, the U.S. Energy Information Administration projected truck miles traveled (the dominant mode of freight movement in the U.S.) will grow by 52 percent from 397 billion miles in CY 2018 to 601 billion miles in CY 2050.50 The U.S. EIA projects growth in vehicle miles traveled between CY 2017 and CY 2050 will be highest for commercial light trucks, followed by freight trucks, and finally light-duty vehicles (see Figure 17).51

One thing is certain — there are more vehicles in operation in the U.S. today than ever before, operating alongside a growing number of trucks of all sizes in operation to deliver all the goods people are now ordering online.
### Share of U.S. Cumulative Miles Driven by Road Type CY2004–CY2019

*(FIGURE 18)*

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<th>Year</th>
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</tbody>
</table>

### Percent Change in Miles Driven per Road Type Versus Prior Year CY2004–CY2019

*(FIGURE 19)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Rural Interstate</th>
<th>Rural Other Arterial</th>
<th>Other Rural</th>
<th>Urban Interstate</th>
<th>Urban Other Arterial</th>
<th>Other Urban</th>
<th>All Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY2019</td>
<td>-0.08</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2018</td>
<td>-0.06</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2017</td>
<td>-0.04</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2016</td>
<td>-0.02</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2015</td>
<td>0.00</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2014</td>
<td>0.02</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2013</td>
<td>0.04</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2012</td>
<td>0.06</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2011</td>
<td>0.08</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2010</td>
<td>0.10</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2009</td>
<td>0.12</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2008</td>
<td>0.14</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2007</td>
<td>0.16</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2006</td>
<td>0.18</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2005</td>
<td>0.20</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
<tr>
<td>CY2004</td>
<td>0.22</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.03</td>
<td>-0.06</td>
</tr>
</tbody>
</table>

### Online Shopping Grows in Popularity

*(FIGURE 16)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Made at least one online purchase in the last 30 days</th>
<th>Average number of online purchases made in last 30 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 NHTS</td>
<td>43%</td>
<td>3</td>
</tr>
<tr>
<td>2017 NHTS</td>
<td>55%</td>
<td>5</td>
</tr>
</tbody>
</table>


### Growing Congestion is Costly

Congestion is a major problem in the U.S., especially in urban areas, where share of overall miles driven continues to grow (see Figures 18 and 19). Nearly 90 percent of individuals aged 16 years and older in the U.S. use a private passenger vehicle to get to work. Today the average private car in the U.S. carries only 1.6 people, and 95 percent of the time the car is parked and not being driven at all.\(^52\) When it is driven, increased congestion often means driving is a frustrating experience — in CY 2018 nearly every major U.S. city recorded a downtown last-mile travel speed below 20 mph.\(^53\)
According to data from the U.S. Census Bureau’s American Community Survey, 86 percent of people in the U.S. use a personal vehicle to commute to work each day (see Figure 21), a number that has fluctuated only moderately since CY 2005. The time many spend commuting to work has also grown (see Figures 22 and 23), and among the fifty largest cities in the U.S., fewer than 12 percent of jobs are reachable within 30 minutes (see Figure 24). Compare to data showing where population growth is highest, and you can see the congestion is likely to get worse (see Figure 13). The United Nations Department of Economic and Social Affairs estimates that by CY 2050, two of every three people are likely to be living in cities and other urban centers, an additional 2.5 billion people.57

Factor in U.S. Department of Transportation estimates that 58 percent of U.S. roads are in less than good condition and 23 percent of bridges need significant repair or can’t handle today’s traffic,58 and the cost of driving gets even worse.

According to research from the Insurance Information Institute, PCIAA and CAS, collision frequency the United States is strongly and positively related to various measures of congestion. To distinguish among the variables and find the ones which best predict collision frequency, a random forest was constructed to compare the importance of each variable to the model. Variables with more importance have the best predictive ability. As Figures 25 and 26 illustrate, five variables stand out: Drivers per Lane Mile (Licensed drivers/lane miles total), Urban Average Commute Time, Rural Average Commute Time, Tort System, and Urban VMT.59
Average Travel Time to Work in the U.S. by Metro Area, CY2017 (FIGURE 23)

SOURCE: AMERICAN COMMUNITY SURVEY TABLE S0802 (HTTPS://FACTFINDER.CENSUS.GOV/FACES/TABLESERVICES/JSP/PAGES/PRODUCTVIEW.XHTML?PRODUCT=ACS_17_1YR_S0802&PRODUCTTYPE=TABLE)

Variable Importance to Collision Frequency (FIGURE 26)

SOURCE: AUTO LOSS COST TREND REPORT, JANUARY 2018 | NOTE: RANKED BY INCNODEPURITY (CHANGE IN PREDICTIONS WHEN A VARIABLE IS RANDOMLY PERMUTED THROUGH RANDOM DECISION FOREST). *ADJUSTED FOR MILES DRIVEN.
Is Ride-Hailing Adding to Congestion?

Ride-hailing’s share of overall miles driven in the U.S. remains small but has seen significant growth. According to data from the National Household Travel Survey, for-hire vehicle use doubled between CY 2009 and CY 2017, a trend believed to be primarily driven by the advent of ride-hailing. The CY 2018 study from Conway, Salon, & King reveals 0.19 percent (±0.04) of person-trips utilized ride-hailing geographically has resulted in outsized impact elsewhere. As usage of ride-hailing or transportation network companies (TNCs) — such as Uber and Lyft — has grown, there is growing debate about whether they add to problems of growing congestion in many cities. Numerous studies published in the last several years look at how TNCs have impacted consumer travel behavior. Schaller Consulting published two studies — its second report on the impact of ride-hailing on urban mobility found 70 percent of Uber and Lyft trips were made in nine large, densely-populated metros: New York City, Boston, Chicago, Los Angeles, Miami, Philadelphia, San Francisco, Seattle, and Washington D.C. The data also found private ride TNC services put 2.8 new TNC miles on the road for each individual mile of personal driving removed, resulting in a 180 percent increase in driving on city streets. Several other reports released in CY 2019 concluded many consumers are using ride-hailing trips instead of walking or public transportation at peak commute times. In April of CY 2019, the city of Chicago published anonymized trip data from ride-hailing companies in operation in Chicago. This data showed the most common ride-hailing trip made during the two-month period of November and December CY 2018 was a 1.1 mile trip from River North West to the Loop, with 80 percent of them occurring between 7:00 am and 7:59 pm, and 84 percent occurring during weekdays. In Seattle, nearly half of all ride-hailing trips originated in four neighborhoods that are some of the city’s most walkable and transit-friendly areas. A study from the Booth School at the University of Chicago found cities with high adoption of Uber and Lyft had 3 percent more total miles driven daily on average than cities with low adoption, and had higher new vehicle registrations.

A common theme among most of these studies is that where these services are available, consumers are using them, and using them a lot. They are willing to pay to do so, even when walking or public transport would be a cheaper alternative. In fact, a working paper from the National Bureau of Economic Research found a consumer surplus of about $6.8 billion for all CY 2015 in the U.S. for Uber. This was based on data from nearly 50 million UberX consumer sessions from the first 24 weeks in CY 2015 from Uber’s four biggest markets that showed Uber customers may have been willing to pay more than they actually did (consumer surplus is defined as the difference between the amount consumers are willing and able to pay for a service versus what they actually pay). TNCs may also lead to a potential decline in public transit. A CY 2019 study by the University of Kentucky’s Department of Civil Engineering of 22 large U.S. cities revealed that for each year after TNCs enter a market, heavy rail ridership can be expected to decrease by 1.3 percent and bus ridership can be expected to decrease by 1.7 percent. Finally, a study from three economists at the University of Louisville and George State University found an increase in self-reported alcohol consumption compared with the year before Uber launches in a city. This study compared data on Uber availability with health surveys from America’s Centers for Disease Control and found on average alcohol consumption rose by 3 percent, binge drinking increased by 8 percent, and heavy drinking surged by 9 percent within a couple of years of a ride-hailing company coming to town. The bright side, of course, is at least these people are not driving drunk.

Not surprisingly as lawmakers try to adapt to the changes being brought by ride-hailing services, many are looking to impose new fees and taxes, and re-classify drivers as employees rather than independent contractors. A study by New York University’s Rudin Center for Transportation Policy recently looked at 13 large major markets including London, San Francisco, New York City and others to understand how cities are rewriting the rules for ride-hailing and found a range of responses, including new regulation around provision of trip data, congestion taxes, strict emission standards and restrictions in congestion zones, and driver pay.

U.S. National Household Travel Survey Person Trips and Household Vehicle Trips CY1969-CY2017 (FIGURE 27)

<table>
<thead>
<tr>
<th>Year</th>
<th>Daily Person Trips per Person</th>
<th>Average Person Trip Length (miles)</th>
<th>Household Vehicle Trips (VMT in millions)</th>
<th>Person Miles of Travel (PMT in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>2.02</td>
<td>9.67</td>
<td>775,940</td>
<td>1,404,137</td>
</tr>
<tr>
<td>1977</td>
<td>2.92</td>
<td>8.87</td>
<td>907,603</td>
<td>1,879,215</td>
</tr>
<tr>
<td>1983</td>
<td>2.89</td>
<td>8.68</td>
<td>1,002,339</td>
<td>1,946,662</td>
</tr>
<tr>
<td>1990 (adj)</td>
<td>3.76</td>
<td>9.47</td>
<td>1,695,290</td>
<td>2,829,936</td>
</tr>
<tr>
<td>1995</td>
<td>4.3</td>
<td>9.13</td>
<td>2,068,368</td>
<td>3,411,122</td>
</tr>
<tr>
<td>2001</td>
<td>4.09</td>
<td>10.04</td>
<td>2,274,769</td>
<td>3,783,979</td>
</tr>
<tr>
<td>2009</td>
<td>3.79</td>
<td>9.75</td>
<td>2,245,111</td>
<td>3,732,791</td>
</tr>
<tr>
<td>2017</td>
<td>3.57</td>
<td>10.7</td>
<td>2,305,882</td>
<td>3,970,287</td>
</tr>
<tr>
<td>2017 (adj)</td>
<td>n/a</td>
<td>11.57</td>
<td>2,332,820</td>
<td>4,291,150</td>
</tr>
</tbody>
</table>

As usage of ride-hailing or transportation network companies (TNCs) — such as Uber and Lyft — has grown, there is growing debate about whether they add to problems of growing congestion in many cities. Numerous studies published in the last several years look at how TNCs have impacted consumer travel behavior. Schaller Consulting published two studies — its second report on the
Emergence of Micro-Mobility

As cities struggle to manage congestion related to cars, many are forging ahead with the expansion of dedicated bicycle lanes and the introduction of micro-mobility solutions, including shared bikes, e-bikes, and e-scooters. In CY 2018, a total of 84 million trips were taken in the U.S. (45.5 million on shared bikes and 38.5 million on e-scooters), double the number taken in CY 2017.61 These types of e-bikes, and e-scooters. In CY 2018, a total of 84 million trips were taken in the U.S. (45.5 million on

Many scooter rental operators struggle to make money due to significant expenses such as depreciation of the e-scooters, the cost to run warehouses that repair and help to position the scooters, and development costs related to the development more durable hardware.72 Lime, the world’s biggest scooter operator had 120,000 scooters on the road globally during the summer of CY 2019, but scooters put on the road in the preceding spring lasted only a median of five months.73 Vandalism is also a problem, thanks perhaps to Instagram sites like Bird Graveyard which celebrate e-scooter stunts and destruction; the growing number of injuries is another major concern.

There are numerous other challenges for e-scooter companies, including regulation and permitting, parking, age requirements, safety equipment requirements, maintenance, and liability when someone is injured.74 Late in CY 2019, the National Conference of Insurance Legislators (NCOIL) met to review a draft of legislation setting insurance requirements for electric scooters. The legislation is modeled after the group’s model for transportation network companies (TNCs) to ensure there is liability insurance coverage in place during any rental period for the scooter company, the rider, and any independent contractors servicing the scooters.75

Trip Data Grows Ever More Valuable

One of the greatest potential benefits of ride-hailing and micro-mobility solutions is the ability to capture trip-level data and use it to understand traffic patterns and infrastructure needs. Uber recently introduced dockless bike and scooter services, added third party services to its app including Lime, and launched new capabilities with the City of Denver to add transit directions and eventually support the ability to buy transit passes through the Uber app. While Uber gets a cut of each ride taken through its app, it also expands the amount of data it now collects on where people are going and how they’re getting there.76

Eventually, highways will have embedded sensors that monitor wear-and-tear and traffic patterns. The state of Colorado is testing this smart road technology. Over the next five years, a half-mile stretch of U.S. Highway 285, southwest of Denver, will be covered with concrete slabs that include Wi-Fi connectivity and embedded fiber optic cables acting as pressure sensors. The technology will enable connection to motorists’ cellphones to provide real-time alerts about traffic and road hazards.77 Another electric road system project began in November 2019, with the island of Gotland in Sweden installing a proof of concept wireless charging road for trucks/buses in an effort to decarbonize the transport sector.78

As more metro areas struggle with growing congestion, understanding where, when and how people are traveling is critical. It is no surprise that automakers are also looking to capitalize on data that is now available with the connected vehicle.

Access to the data sets generated by the numerous electronic control modules throughout the vehicle helps automakers understand how their vehicles are performing. It also gives them new access to how, when and where their customers are driving — creating an opportunity to develop new products and services.79 March CY 2019 data from Statista indicates overall revenue from the connected car segment is expected to grow, but average revenue per connected car has fallen (see Figure 30).80
Connectivity, when billed as a subscription service by the automaker, continues to see only limited uptake by consumers. Because most new vehicles have limited maintenance issues during the first several years of ownership, the perceived value of a connected car subscription that provides vehicle system monitoring is much less. The connected car data is more valuable to automakers first several years of ownership, the perceived value of a connected car subscription that provides help automakers deliver less expensive and disruptive defect remedies. In CY 2018, nearly 8 million vehicles in the U.S. were affected by software-based defects — a larger number than the previous five years combined. Dealers can use that data to bring in service and preventive maintenance work.

It is thought that the value of the data alone will encourage automakers to explore alternative business models. Audi’s new eTron launch strategy offers an a la carte menu of options where it is thought that the value of the data alone will encourage automakers to explore alternative business models. It is thought that the value of the data alone will encourage automakers to explore alternative business models. Audi’s new eTron launch strategy offers an a la carte menu of options where drivers can buy connected car features on demand. Other automakers offer certain types of service — such as roadside assistance and accident detection — at no additional fee. These types of services are among the most valued connected car services. For example, in the case of an accident, a connected vehicle can share crash data and initiate first notice of loss with the automaker through its connected vehicle program. The OE can be the first to engage with that customer, provide emergency services, and provide information on their certified repair network. They also can share crash data with the insurer and repairer, helping drivers move seamlessly into the entire claims process.

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as the cause of the crash nor as assignment of fault, instead it is often the last failure in the causal chain of events leading to the crash.91 Also worth noting is the additional detail on critical reason assigned to drivers shows recognition error (includes driver’s inattention, internal and external distractions and inadequate surveillance) and decision error (includes driving too fast for conditions or the curve, illegal maneuver and misjudgment of gap or others’ speed) account for nearly three quarters of the accidents researched (see Figure 32).


SOURCE: NATIONAL SAFETY COUNCIL. INJURY FACTS® 2017 EDITION, P.119. CITED SOURCE NHTSA (DOT HS 812 115)

- Recognition error
- Decision error
- Performance error
- Non-performance error

94% 2% 2% 2%

In a CY 2014 task force report, the Casualty Actuarial Society (CAS) deconstructed the NMVCCS and found only 32.5 percent of accidents were caused by human behavior, while 21.3 percent could be attributed to technology issues (figures do not add up to 100 percent to reduce duplication of accidents with multiple causation).92 Despite the different conclusions drawn by NHTSA and the CAS, what both analyses highlight are the dangers of speeding, but also driver distraction. In the U.S., an estimated 9 to 10 percent of all fatal crashes between CY 2013 and CY 2017 were from distraction-affected crashes.93

Changes to vehicles themselves hasn’t necessarily helped either. According to data from IHS Automotive, the number of vehicles built in North American with display screens measuring 7 inches or more has grown by 75 percent in the past five years from 6.3 million to 10.9 million.94 During that same time period the average screen size has also increased from 6.4 inches to 7.3 inches.95 AAA has found that wider use of touch screens that often replace more familiar knobs and buttons can be distracting.96

Among the nearly 300 million vehicles in operation in the U.S., it is estimated roughly 80 percent of them are at Level 0 automation, where the driver is supposed to be in control of the vehicle 100 percent of the time. For drivers who tend to engage in dangerous and distracting behaviors, telematics also offers the ability to track and provide feedback (through scorecards or even discounted insurance premiums) on driving behavior, which may prevent bad behavior in the first place. According to CY 2019 data from PTOLEMUS, among insurers selling usage-based...
insurance, 70 percent track harsh braking, 65 percent track speeding, and 61 percent track rapid acceleration.98 Among the insurance company programs they analyzed that were smartphone-centric they found 80 percent use rapid acceleration and harsh braking, 57 percent use cornering, 50 percent consider night time driving or peak time driving; and 27 percent use contextual data sets such as road type and traffic data.98 Early data from telematics providers revealed one of the major benefits of telematics was supported by the self-selection theory that those drivers that opted in were less accident prone due to being lower mileage drivers. More recent data also suggests that telematics can help reduce distracted driving, which, when accidents do occur, do so at lower speeds, leading to a lower cost of claim.99 Ensuring the driver is aware of the risk he/she is taking behind the wheel has been shown to lead them to practice safer habits. This is particularly true within the commercial insurance sector.

Telematics’ Opportunity to Help Commercial Auto Insurance

The adoption of telematics among commercial fleets is advancing even faster than among personally owned vehicles. Commercial auto is best poised to use data such as driver behavior, driver routes and route densities, weather, and other connected vehicle data to improve the accuracy of risk assessment and product pricing. With the significant growth in e-commerce, fleet traffic and demand for commercial auto insurance has increased, and the ‘last mile’ challenge has led to greater diversity among commercial fleets in terms of who is actually driving, when and where they are driving, and what they are driving.

Telematics adoption within the commercial fleet has grown dramatically, with an estimated 20 million units expected in the next three years, up from 13 million today. A survey conducted by Teletrac Navman in its CY 2019 U.S. edition of Telematics Benchmark Report revealed vehicle tracking and driver hours are monitored most today with telematics (see Figure 33).100 In fact, much of the growth in telematics adoption was driven by a federal mandate for incorporation of Electronic Logging Devices (ELDs) and Automatic On-Board Recording Devices (AOBRDs). Future growth is anticipated to come from products such as asset monitoring of trailers, shipping containers, and driver behavior management systems.101 More commercial fleets are adopting telematics solutions with video and artificial intelligence integrated, which help to provide additional context, promote safer driving behavior among drivers, and potentially lower accident frequency/severity and lower insurance premiums.

It’s estimated that the annual accident rate for commercial fleets is around 20 percent, and the average loss related to fleet vehicle accidents is approximately $70,000.102 It’s no wonder with increased fleet miles in the U.S. that commercial auto has seen higher frequency and loss cost trends over the last several years.

Challenges Abound for Commercial Auto Insurance

Commercial Auto Insurance continues to experience difficult results. The combination of these factors drives commercial auto frequency and severity trends: the growth of e-commerce driving demand for more vehicles, miles driven; difficulty finding experienced drivers; higher tort costs; deteriorating roads; increasing driver distraction; increases in medical inflation; increased rate of high-speed survival with significant rehabilitation costs; and higher loss costs due to vehicle technology.103 Since CY 2011, the direct combined ratio for commercial auto has exceeded 100 percent (see Figure 34), although the industry did see some modest improvement in its profitability with the incurred loss ratio improving to 69.1 percent in CY 2018 from 70.2 percent in CY 2017.
In response, carriers raised prices, with price increases near or above double digits for 10 consecutive quarters as of Q4 CY 2019. Data from the American Transportation Research Institute shows the average annual cost per mile for truck insurance premiums rose 42 percent between CY2010 and CY2018, from $0.06 per mile to $0.08.¹⁰⁴ In the Commercial Property & Casualty Market Outlook Q4 2019-2020, USI predicts rates for primary auto liability with fleet lower than 200 and good loss history will increase 10 to 15 percent, while those same fleets with poor loss history will see rates increased between 15 and 25 percent. Fleets in excess of 200 could see rates up between 15 and 30 percent.¹⁰⁵ And while technology such as ADAS features and telematics will eventually help improve frequency, for now benefits are small.

Many fleet service vehicles tend to use the lowest base trim level package on trucks, and often don’t have the option to order ADAS features, or often find the cost-benefit hard to prove.¹⁰⁶ There is also concern that the ADAS features may create a false sense of security among drivers — for example relying on backup cameras versus walking around the vehicle prior to backup up or looking over their shoulders. For fleets that do purchase vehicles with the ADAS features, rising repair costs is also a concern.

Looking forward to CY 2020, there is some hope the industry will see better results. Despite rising freight volumes, the cost of freight (measured as door-to-door spot rate index) fell sharply in CY 2019, driving the portion of the trucking industry closely tied to the factory sector into a recession. In the first half of CY 2019, around 640 trucking companies went bankrupt, and U.S. jobs data shows 5,100 trucking payrolls were slashed in August and another 4,200 were cut in September.¹⁰⁷ Demand for freight services had weakened in part from ongoing trade policy disputes. While this is not great news for the trucking industry as a whole, it could result in improved frequency and repair costs is also a concern.

Reduced Accident Frequency, but Rising Costs Likely for Personal Auto in 2020

Private passenger auto claim frequency has followed a downward trend since the early 1980’s. While there has been fluctuation as the economy improved or slid into recession, recent increases in CY 2015 and CY 2016 are beginning to reverse; paid claim frequency for both collision and property damage liability is at or below the levels from CY 2007 (see Figure 35).¹¹² According to the ISS Fast Track Plus reports, private passenger auto collision frequency closed out CY 2018 down 1.5 percent versus CY 2017, and the four quarters ending Q3 CY 2019 show collision frequency down -1.8 percent from one year prior (see Figure 36).¹³ Private passenger auto property damage liability frequency also declined 3.9 percent in CY 2018 from CY 2017, and the four quarters ending Q3 CY 2019 show liability frequency down another -3.8 percent (see Figure 37).¹⁰⁸ Devastating wildfires, hurricanes, and thunderstorm events (includes tornadoes, hail, and straight-line winds) in numerous parts of the U.S. in CY 2019 resulted in comprehensive loss frequency up 3.0 percent for the four quarters ending Q3 2019 versus a decline of -2.1 percent in CY2018 (see Figure 38).¹³
from CCC customers reveals repairable claim counts fell just over 1 percent in 2019, but when total loss claim counts were included, claim counts were essentially flat for the full year (see Figure 39).

Police-reported crashes tracked by NHTSA (crashes in excess of a pre-determined dollar amount) provide a mixed picture of overall motor-vehicle accident counts in the U.S. (see Figure 40). Between CY 2011 and CY 2015, police-reported accident counts in the U.S. were increasing. However, in 2016 NHTSA replaced the National Automotive Sampling System General Estimates Systems (NASS GES) with the modernized Crash Report Sampling System (CRSS),114 which made year-over-year changes from CY 2015 more difficult to understand. For the updated 2016, 2017 and 2018 reporting, NHTSA implemented a change in how injury estimates are derived. Today, they are based on people injured in fatal crashes from FARS, and estimated people injured in non-fatal injury crashes from CRSS or NASS GESS. Previously NHTSA estimated people injured solely on information from CRSS or NASS GES.

A change was also made to how property-only-damage (PDO) crashes were reported in 2018. Previously at 6 of the 60 CRSS sampled data collection sites, police officers could report the PDO costs as “unknown.”115 Updates to the State’s reporting criteria for these sites removed “unknown” as an option, converting many PDO crashes with unknown property damage costs into reportable crashes in 2018. Previously these were considered non-reportable crashes. Subsequently the 4.4 percent increase measured in crashes overall for NHTSA — while statistically significant per NHTSA — is primarily related to those changes. Hopefully, as data from CY 2019 becomes available, a clearer picture will emerge from the NHTSA data on the trend in motor vehicle crashes in the U.S.

What remains to be seen is whether overall growth in the vehicles in operation in the U.S. — from both new vehicle registrations and slower scrappage growth — will counter declining auto claim frequency, and still result in growth in the actual number of vehicles in accidents. Data collected
For the private passenger auto sector, however, average claim costs across all three lines of coverage continue to climb, though not as sharply as the increases in CY 2016. Personal auto insurance profitability suffered in CY 2015 and CY 2016 as increases in both frequency and loss costs exceeded premiums collected. Several years of increases in personal auto premium (7.3 percent in CY 2016, 8 percent in CY 2017, and 6.5 percent in CY 2018) combined with some slowdown in frequency helped combined ratios fall below 100 again, after several years where it was much higher (see Figure 40).

Prior Yr

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatal</th>
<th>% Chg</th>
<th>Prior Yr</th>
<th>Injury</th>
<th>% Chg</th>
<th>Prior Yr</th>
<th>Property Damage Only</th>
<th>% Chg</th>
<th>Prior Yr</th>
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<td>4,304,000</td>
<td>2.1%</td>
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<td>6,900,000</td>
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<td>4,275,000</td>
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<td>30,865</td>
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<td>4,129,000</td>
<td>3,847,000</td>
<td>-2.8%</td>
<td>4,129,000</td>
<td>5,346,000</td>
<td>-1.6%</td>
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<tr>
<td>CY2010</td>
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<td>-1.4%</td>
<td>30,348</td>
<td>3,776,000</td>
<td>-1.8%</td>
<td>4,068,000</td>
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<td>5,354,000</td>
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<td>4,387,000</td>
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<td>4,530,000</td>
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<td>n/a</td>
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<td>4,807,000</td>
<td>6.1%</td>
<td>5,254,000</td>
<td>6,734,000</td>
<td>4.4%</td>
<td>6,967,000</td>
</tr>
</tbody>
</table>

How Does ADAS Impact Accident Frequency?

A review of new vehicle launches in the U.S. underscores the growing prevalence of advanced driver assistance systems. Advanced driver assistance systems (ADAS) include technologies such as front crash prevention or warning, lane departure warning (LDW), blind spot detection, park assist, back-over prevention, obstacle detection, and automatic emergency braking (AEB). While there is no requirement or mandate from NHTSA that requires automakers to add these features to their vehicles, in March 2016, NHTSA and IIHS announced that 20 major automakers committed to equip all vehicles of curb weight less than 10,000 pounds with automatic emergency braking (AEB) and frontal crash warning (FCW). These automakers comprise 99 percent of all vehicles sold in the U.S. annually. Specifically, the automakers committed to make AEB standard on virtually all light-duty cars and trucks with a gross vehicle weight of 8,500 pounds or less (Level 0), and on virtually all trucks with a gross vehicle weight between 8,501 pounds and 10,000 pounds (Level 1). The industry anticipates elevated claim costs to remain the norm in the near term. New vehicle technologies, consumer preference for light trucks and higher trim levels are driving up vehicle loss costs, and technologies that are supposed to help prevent accidents, while effective, are not yet pervasive enough to result in significantly fewer accidents.

![Figure 41](source: III 2020 INSURANCE FACT BOOK)
Given the wide array of ADAS technologies in the marketplace today, the variation in how they are packaged, the different designs and goals of each system, and the rate at which each is entering the marketplace, it is difficult to project what the real long-term impact on auto claim frequency and auto loss costs may be. In prior issues of Crash Course, analysis gauged what percentage of auto claims might benefit from ADAS features such as frontal crash avoidance, AEB, lane departure warning, adaptive headlights, and blind spot monitoring given the mix of auto claims by age and loss coverage. The Insurance Institute for Highway Safety/Highway Loss Data Institute (IIHS/HLDI) predictions on the increase in percent of registered vehicle fleet equipped with each ADAS system to CY 2050 in the U.S. also was used. Finally, pooled data from analyses conducted across automakers on the likely reduction in frequency was incorporated.

While research conducted over the last year reached similar conclusions to prior years’ research on ADAS efficacies, automakers have ramped up their incorporation of ADAS features like AEB earlier than the MY2022 commitment date, and the predicted rate of adoption was updated from prior years’ analysis. As a result, our projection this year shows a slightly faster increase in the reduction of vehicles in accidents annually, although decline eventually flattens as ADAS is added to nearly 100 percent of the vehicle fleet (see Figure 43). So, while this remains only a high-level estimate, it underscores the inevitable decline in frequency that these systems will have as ADAS market penetration grows. This projection also does not account for the potential adoption of aftermarket devices such as those created by Mobileye which have been shown to improve driver safety and could help lead to additional reduction in crash frequency.119

In Crash Course 2018 and Crash Course 2019 we looked at early data on differences in crash frequency, crash characteristics, and crash severity among the same vehicle when equipped or not equipped with ADAS. Comparison of the vehicles with and without ADAS, and the Delta-V of the crash (total change in vehicle velocity over the duration of the crash event), also implied ADAS may be helping to reduce low-speed crashes altogether, and slows the speed of the vehicle prior to impact for crashes that might otherwise have had higher Delta-V at crash impact. This year, we compare the potential impact to accident types among a subset of automakers who have met the NHTSA AEB commitment for 90 percent or more of their vehicles by MY2019, versus a second subset of automakers who have met the commitment for 20 percent or fewer of their vehicles by MY2019 (see Figure 44). Collision loss vehicles in each of the two groups were segmented by vehicle age group, and comparison was made among each primary point of impact’s share of volume over a five-year period. For those automakers >=90 percent equipped, current model year vehicles saw a 2.9 percentage point drop in their share of losses that were “Front Primary Impact” for Q4’14-Q3’15 (MY2014-MY2016 vehicles) versus Q4’18-Q3’19 (MY2018-MY2020 vehicles). The implication is that as these automakers have more of their vehicles equipped with AEB, volume share has shifted from direct front impacts to the rear and side impacts. This is reinforced by the comparison to the collision losses for automakers <=20 percent equipped, whose current model year vehicles saw only a 1.3 percentage point drop in their share of losses that were “Front Primary Impact” for Q4’14-Q3’15 (MY2014-MY2016 vehicles) versus Q4’18-Q3’19 (MY2018-MY2020 vehicles).
In February 2019, IIHS/HLDI published results of research conducted on police crash-report data from 23 states during 2009-2016 for striking passenger vehicles with and without autobrake among models on which the system was optional. They wanted to identify the types of rear-end crashes in which vehicles with autobrake are involved to help identify where autobrake could be improved to address a broader set of accident scenarios. The research found more than two-thirds of the crashes occurred when the road surface was dry, the striking vehicle was moving straight, or the struck vehicle was slowing or stopped. Of the remaining one third of crashes, the crash-involved vehicles with autobrake were turning, struck a vehicle that was turning or changing lanes, struck a non-passenger vehicle, were driving on a snowy or icy road, or were driving on a road with a 70 mph or higher speed limit. This data helps underscore why AEB equipped vehicles may be seeing a larger drop in collision front impacts.

There is hope that advances in vehicle technology such as ADAS will, over time, lead to fewer accidents, and subsequently fewer people and vehicles to fix. In the near term however, vehicles have many more sensors, cameras, radar, lidar, etc. and complex material construction than ever before. The wide variation in technologies used among the OEs is leading to challenges for repairers, where the importance of understanding each and every individual vehicle has become critical. These changes also mean the industry is making major investments in tooling, training, and data to ensure it is equipped to properly return vehicles to pre-accident condition. Near-term challenges abound, and certainly ADAS seems to be another factor driving the trend of fewer but more expensive claims.
Heart-pounding music has long been the backdrop to the sleek silhouette of vehicles gliding flawlessly down the road in automotive advertising. And while the easy handling and beauty of new vehicles remains important, automakers today are highlighting much more — safety and simplicity. Think about it: Honda’s “What If” advertising campaign, which debuted in late 2019, features a new kind of heart-pounding moment when a man (a coworker, a father, a husband) is nearly hit. The vehicle’s collision-mitigating braking system prevents the accident. Viewers exhale.

Volkswagen, Subaru, and Volvo capture our attention by highlighting advanced driver-assisted systems (ADAS) in commercials, encouraging consumers to expect more from their vehicles. Expectations that expand beyond safety to include technology-aided assistance, prominently featured in Hyundai’s “ghost car” ad, debuting in the OEM’s 2020 Super Bowl spot. The self-parking and “unparking” features work to extend consumer expectations of vehicle assistance.

What these ads, and the OEMs we speak with, want to make clear is that their relationship with drivers is changing. OEMs are now companions on the driver’s journey, providing relief and comfort along the way. And, this seems to be good for business.

A 2019 survey by Fundera noted that 80 percent of U.S. drivers would pay more for a vehicle if it was accompanied by a better experience.¹ ADAS and telematics are the driving forces behind the driving experiences of the future.

However, the picture isn’t entirely rosy; these same features increase the cost of vehicle repair. And, even with more new technologies, not all accidents can be avoided. But, with the assistance of CCC, OEMs can help drivers navigate and recover from unplanned events.

Connecting OEMs and Drivers

The relationship between OEMs and drivers no longer stops at the point of purchase; it now extends beyond the vehicle itself. CCC’s Accident Advisor keeps OEMs connected to drivers post-accident, providing a medium to guide consumers through the claims and repair experience. With Accident Advisor, OEMs can:

• Guide drivers to quickly and safely document the accident scene and initiate the claims process with their insurance provider through a singular experience.

• Connect more seamlessly with repair facilities. Diagnostic scans inform repair facilities while performing a thorough repair of vehicles.

• Help drivers replace vehicles following an accident. Today, about 20 percent of accidents result in a total loss, and some consumers may decide to replace their vehicles after an accident.

Providing drivers with support during a confusing and stressful time can help OEMs distinguish themselves with unique services that drive customer satisfaction and brand loyalty.

Through telematics, OEMs can be a gateway to insurers to round-out the vehicle ownership experience. With driver consent, CCC® VIN Connect connects vehicles from the OEM point of purchase to CCC to support insurers who may offer personalized insurance rates or reward good behaviors. CCC® VIN Connect Safety also provides insurers with a clear view of vehicle ADAS features, which is designed to help underwriters factor in vehicle technology and accident-avoidance features when calculating rates.

Vehicle technology provides a platform for expanded relationships. By helping automakers connect with drivers beyond the initial purchase and — more importantly — after an accident, CCC can help OEMs build deeper relationships with their customers.

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Senior Director,
OEM Market
Development, CCC

BEYOND THE VEHICLE: OEM TECHNOLOGY DRIVES ENHANCED CONSUMER EXPERIENCE
by Manjaree Harwood

OEMs are now companions on the driver’s journey, providing relief and comfort along the way.”

¹ SHEPARD, MADIE, “13 SURPRISING BRAND LOYALTY STATISTICS.” HTTPS://WWW.FUNDERA.COM/RESOURCES BRAND-LOYALTY-STATISTICS. JULY 23, 2019
Auto sales in the U.S. remained strong in 2019 with 17.1 million new vehicles and nearly 40 million used vehicles sold. Analysts are predicting sales will slow in the coming years, but with vehicles lasting longer than ever before, scrappage rates low, and a decline in miles driven per vehicle annually, there will be many vehicles on the road in the U.S. for quite some time.

Analysis of the demographics of age suggest that the anticipated drop in auto sales and auto claim frequency from Millennials staying put in urban areas and using only ride-hailing instead of purchasing their own vehicle may be much smaller than anticipated. Numerous studies reveal that it is primarily differences in economics not preferences that have led to the delay in life choices by Millennials versus prior generations. The question ultimately becomes how new factors such as more online shopping, greater digital capabilities enabling more work-from-home, an aging population, and higher rates of migration to the West and South will drive auto claim frequency in the future.

Unfortunately, drivers face more congestion and potential for distraction, so despite lower per vehicle exposure to accidents from people driving their vehicles less, the overall count of motor vehicle accidents in the U.S. may not see any meaningful decline for some time. ADAS technology has been shown to be very effective at reducing crashes in the scenarios in which they are best designed to work, but most vehicles on the road are still not ADAS-equipped, and the technology doesn’t address every type of accident scenario. As we’ll discuss later, the ADAS technology is among the new features of vehicles that add to repair complexity, ultimately driving up claim costs for the industry in the near-term.

Automakers and other technology companies continue to make large investments in "ACES," but full-blown Level 5 autonomy will likely take longer than earlier predicted. Billions of dollars are being spent to gear up for electric vehicles, but sales remain tepid. Of the four key megatrends, it is perhaps the connected car that offers the most immediate benefits, particularly as automakers look for ways to remain top of mind among vehicle owners throughout the vehicle life cycle. Using data collected from the vehicle may be the best way yet to understand what customers really use among the numerous technologies now being added to vehicles, helping automakers potentially reduce the cost of unused features but also enable all industry players to better understand their customers.
Today’s vehicles are very different than vehicles manufactured even 10 or 20 years ago.

Automakers made numerous changes and enhancements to vehicle construction, material types, content and more to improve vehicle crash worthiness, crash avoidance, and vehicle emissions, and to offer new types of capabilities like telematics, adaptive cruise control, and over-the-air updates.
All these modifications changed not only the how and what the vehicle is made of, but also resulted in the addition of numerous new vehicle components. Figure 46 illustrates the growing share of electronics and software to vehicle costs over the last two decades. Changing consumer preference resulted in many more light trucks versus cars, and more consumers opting for higher trim levels than ever before.

With the increase in vehicle complexity, repair complexity has also grown. Consumers increasingly rely on new features such as ADAS, and all industry participants need to be invested in having repairs deliver the vehicle back to pre-accident condition. Today that means making access to training, tooling, and data available, and using them to provide the best repair outcomes.

In this section of Crash Course 2020 we discuss how the industry is investing in capabilities to repair the vehicles of today and tomorrow, and what that means to repair cycle time and repair costs.

In CY 2019, the industry experienced a ramp-up in the annual rate of change in repairable claim costs from prior years. The average total cost of repairs overall for all repairable appraisals was $3,225, up 4.9 percent from CY 2018. By comparison, overall inflation for All items not seasonally adjusted increased 1.8 percent in CY2019. Comprehensive and liability losses saw the largest increase in average costs over the last several years, followed by collision losses (see Figure 47). Severe weather in numerous parts of the country over the last several years led to significant swings in volume share of comprehensive losses related to hail and flooding (see Figure 48), as well as to vehicle age of comprehensive losses and the share of which were repairable versus total loss claims (see Figure 49). For example, in Q4’16-Q3’17, Hurricane Harvey struck Texas, flooding large volumes of vehicles, driving the age of comprehensive losses younger than in other periods, and resulting in higher total loss costs. With the severity of storms growing due to climate change, the industry can expect to see similar volatility in claim count and makeup in the coming years. These losses are unlikely to benefit from the ADAS technology being added to vehicles; if anything, it will drive the replacement and repair costs of these vehicle claims up further.

Software and Electronics Share of Vehicle Cost to Exceed Value of Mechanical Components by 2020 (FIGURE 46) | SOURCE: ETI/MARTEC

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<th>Year</th>
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<th>Electronics</th>
<th>Software</th>
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<td>30%</td>
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</table>

Repair Costs Accelerate

In CY 2019, the industry experienced a ramp-up in the annual rate of change in repairable claim costs from prior years. The average total cost of repairs overall for all repairable appraisals was $3,225, up 4.9 percent from CY 2018. By comparison, overall inflation for All items not seasonally adjusted increased 1.8 percent in CY2019. Comprehensive and liability losses saw the largest increase in average costs over the last several years, followed by collision losses (see Figure 47). Severe weather in numerous parts of the country over the last several years led to significant swings in volume share of comprehensive losses related to hail and flooding (see Figure 48), as well as to vehicle age of comprehensive losses and the share of which were repairable versus total loss claims (see Figure 49). For example, in Q4’16-Q3’17, Hurricane Harvey struck Texas, flooding large volumes of vehicles, driving the age of comprehensive losses younger than in other periods, and resulting in higher total loss costs. With the severity of storms growing due to climate change, the industry can expect to see similar volatility in claim count and makeup in the coming years. These losses are unlikely to benefit from the ADAS technology being added to vehicles; if anything, it will drive the replacement and repair costs of these vehicle claims up further.
To better understand the dynamics behind the change in average appraisal cost, consider the primary components contributing to overall repair costs: parts and labor, and an analysis of the changes within the population of repaired vehicles in terms of vehicle age, manufacturer and type (see Figure 50). Growth in the average number of parts replaced per claim as well as more labor hours per claim largely account for the rise in repair costs. Increasing vehicle complexity — both in terms of the materials used in the construction of the vehicles, as well as an increased number of standard options, are helping to lift costs.

Parts and Labor Drive Repair Costs

The distribution of repair cost dollars has changed little over the last 15+ years, the timeframe in which CCC tracked this information. The most significant change is the increase in both the share of overall dollars spent on replacement parts and sublet/miscellaneous operations (see Figure 51). Replacement parts make up about 40.2 percent of overall repair dollars, but the distribution of overall parts dollars by part type has shifted towards greater non-OE utilization.
At the close of CY 2019, the industry’s share of replacement part dollars was split at 61.8 percent OEM versus 38.3 percent non-OEM (see Figure 52). Between CY 2018 and CY 2019 the average number of replacement parts increased from 9.9 parts to 10.5 parts, while the average number of repaired parts per claim have also increased (see Figure 53).

The average price paid per replacement part experienced only moderate increases at an aggregate level (see Figure 54); however, when looking at some of the top replaced parts — such as bumper covers, fenders, etc. — the impact of auto tariffs and material costs is more impactful (see Figure 55). As more newer model year vehicles enter the claim mix, there will be an increase in the share of overall spend per part on OEM parts, as use of non-OE parts may be used less frequently on newer model year vehicles, and the actual cost of the parts tends to be higher for the newer model year vehicles as well.
Finding and keeping collision repair technicians remains a primary concern for the industry. According to the CREF/I-CAR Snapshot of the Collision Repair Industry 2019, 56.4 percent of the survey’s respondents reported hiring at least one entry-level technician during the previous 12 months, and the largest source of all technician hiring was hiring from another shop, followed by hired from a non-automotive industry or as first job, and hired from a related automotive industry (see Figure 57). Even auto dealers are facing a critical shortage of service technicians — only about 37,000 auto mechanics are graduating from U.S. technical colleges and training programs per year — barely fulfilling half of the roughly 76,000 technicians needed annually to keep pace with retirements and new jobs in the sector. This is particularly concerning given the need for more vehicles to potentially require service at a dealership to complete some of the more complex scan and/or calibration procedures, where a shortage of technicians with the needed skills leads to longer overall cycle times.

Materially Different

To improve vehicle crashworthiness and occupant safety, automakers designed vehicles with more energy transfer built into the vehicle design. Combine that with numerous materials, and vehicles are performing differently and handling crash energy differently. Stronger materials are being used in the front structure or in the upper and lower rails to reduce crush in the occupant compartment, often creating challenges when identifying where the energy from a crash traveled through a vehicle, and where that vehicle might be damaged. The materials used in vehicle construction are also changing. As automakers race to meet the ever-stricter corporate average fuel economy standards, they increasingly use lighter-weight materials such as aluminum, boron, ultra-high strength steel, and magnesium to reduce the overall weight of the vehicles themselves. As technology reduces the cost and speed of vehicle development through advances in electronic

Source of Technicians Hired at Collision Repair Facilities (FIGURE 57)

SOURCE: CREF I-CAR SNAPSHOT OF THE COLLISION REPAIR INDUSTRY SURVEY 2019

The average number of labor hours per appraisal uploaded to CCC on behalf of insurance companies in CY 2019 was up by one-tenth of an hour. These same appraisals showed moderate increases in the average hourly labor rate nationally. Combined, these factors help explain the increase in average repair costs overall. The hourly labor rates saw moderate increases year-over-year during the recession, closing out CY 2019 up over 2 percent (see Figure 56).

Average Labor Rates per Labor Category CY2015-CY2019 (FIGURE 56)

SOURCE: CCC INFORMATION SERVICES INC., CCC NATIONAL INDUSTRY

Materially Different

To improve vehicle crashworthiness and occupant safety, automakers designed vehicles with more energy transfer built into the vehicle design. Combine that with numerous materials, and vehicles are performing differently and handling crash energy differently. Stronger materials are being used in the front structure or in the upper and lower rails to reduce crush in the occupant compartment, often creating challenges when identifying where the energy from a crash traveled through a vehicle, and where that vehicle might be damaged. The materials used in vehicle construction are also changing. As automakers race to meet the ever-stricter corporate average fuel economy standards, they increasingly use lighter-weight materials such as aluminum, boron, ultra-high strength steel, and magnesium to reduce the overall weight of the vehicles themselves. As technology reduces the cost and speed of vehicle development through advances in electronic
Most vehicle repairs today now recommend completion of a pre-repair scan, post-repair scan, and often an in-process scan to get a comprehensive understanding of what is damaged and to verify proper repair. Additionally, repairers must identify what electronic systems the vehicle has, which of them has been damaged, and which components need to be removed, replaced, R&I’d, disconnected, and/or refinished. Diagnostic trouble codes (DTC’s) triggered by the scan also need to be researched, as OE repair procedures are updated frequently.

In CY 2015, numerous OEs released position statements underscoring the critical nature of performing these vehicle scans. As a result, industry awareness and the practice of scans has grown. In first quarter CY 2016, less than a half-percent of appraisals included an entry denoting a “scan/diagnosis/health check/asTech” operation (see Figure 59). By Q4 CY 2019 that percentage grew to 49.5 percent. Note that the absence of a scan entry in the appraisal does not necessarily mean that the scan was not performed — just not recorded in the appraisal itself. As the completion of the scan(s) now is a standard part of most repairs, the industry has adapted, and the average fee per scan fell from $110 per scan in Q1 CY 2016 to just $68 per scan by Q4 CY 2019.

Percent of Repairable Appraisals by Vehicle Age Group with Appraisal Line for “Scan/Health/asTech/Diagnose” (FIGURE 59) | SOURCE: CCC INFORMATION SERVICES INC., CCC NATIONAL INDUSTRY
NOTE: QUERY TO PULL DATA UPDATED FOR CRASH COURSE 2020 AND DATA MAY DIFFER FROM PREVIOUSLY PUBLISHED DATA.

With a greater number and variety of high-tech materials used in the construction of their vehicles, automakers are releasing studies and bulletins that underscore the criticality of following the recommended repair procedures and methods so the vehicle is repaired safely and will perform as designed in any subsequent collisions. Growth in electronic vehicle content — items added to address vehicle safety or convenience — adds to the overall cost and complexity of repair and the need to understand recommended repair procedures.

Electronics and Software Growth Drives Need for Additional Skills and Tooling

Consumer demand for ADAS to help avoid or mitigate an accident has grown dramatically. These technologies are driving the rapid addition of microprocessors, sensors, cameras, radar and other technologies into vehicles, and numerous software programs to connect to this broad array of sensors and cameras.

As the number of connected cars grows, the opportunity to capture data — such as a vehicle health scan that includes diagnostic trouble codes — facilitates the ability for all parties involved in the repair to understand the nature of the vehicle damage. In early January 2020 CCC and American Honda Motor Co. announced plans to integrate Honda’s scanning cloud technology into the CCC™ X data exchange. CCC™ Diagnostics is designed to enable repair facilities to request and receive scan data, clear codes, and rescan directly from within the system they use every day, minimizing hardware and software requirements and eliminating the need for manual entry of scan report data. Finally, the ability to integrate the data into the overall repair file provides documentation about the scans, should questions arise later.
According to MOTOR’s Guide to Estimating, the reset of an electronic module (of any kind) is not included in the replacement time for that module. Rather, the reset time is separate, and can vary widely due to wide variation among individual vehicles and system complexity. Similarly, computer module reset and electronic memory functions reset (after battery disconnect) are also not included with any labor operation. Many of the vehicles equipped with ADAS require “zero-point calibration” following replacement of system parts and sensors.

Calibration essentially tells a vehicle’s internal computers to readjust the cameras, sensors and other technology to function according to the vehicle’s OE specifications. A dynamic calibration may require the vehicle be test driven at certain speeds for a specified period — and that it be driven on certain types of roads with specific types of lane markings all while plugged into a scan tool. A static calibration often requires OE specific targets and equipment, such as heating devices, lasers, jigs, cameras and Doppler devices. Conducting a calibration can vary by manufacturer, and requires OEM service information as well as scan tools. The time to recalibrate these sensors and cameras may vary depending on the complexity of the systems, and differs from a scan, which is done to identify problems within a system. Perhaps most concerning is the fact that there is no indicator — like a DTC or dash light — to inform the repairer that the system is not calibrated, or the sensors are not aimed correctly. Following the vehicle-specific procedures and requirements, and documenting they have been completed properly, is critical to being able to demonstrate accurate calibration has occurred.

When a part such as a distance sensor is replaced, additional database labor time of 0.2 to 0.6 hours is commonly added as an entry such as “FRONT BUMPER Add for distance sensor.” In addition to this, some repairs include separate manual entries for calibration, depending on the components damaged or the vehicle repair requirements. The specific parts requiring calibration are not always identified clearly or at all. Unsurprisingly, the majority of calibration line entries in appraisals identify a specific ADAS feature such as blind-spot monitoring sensor, distance sensor, camera, parking sensor, lane departure, adaptive cruise control, as well as mechanical parts such as occupant sensors, steering angle sensors and tire pressure monitoring sensors, and finally parts such as headlamps.

In Q4 CY 2019, 2.6 percent of all appraisals included an additional entry for “calibration,” “re-program,” “flash,” etc., up from 0.9 percent in Q1 CY 2017 (see Figure 60). As additional supplements come in for repairs from Q4 CY 2019, the percentage likely will climb to meet or exceed the 2.8 percent of Q3 CY 2019. There is, however, a wide range in these types of fees, with certain entries including not just the cost of calibration, or a fee to “Drive to and from calibration,” but the cost of additional components that may have been found to need replacement during the calibration. Figure 61 illustrates the average fees per calibration estimate line (includes manual and database lines), and the maximum fee per quarter from Q1 CY 2017 to Q4 CY 2019.
Completing the proper diagnostics, determining which components are included in the repair that might require calibration, and reviewing the OEM repair procedures can help a repairer incorporate the calibration into the repair plan up front. These steps could potentially help avoid added costs and repair time identified later in supplements, that can also lead to lower customer satisfaction with the repair. Analysis of calibration entries included in appraisals between CY 2017 and CY 2019 suggest the industry has room for improvement here — less than 40 percent were included in the original estimate of record, and of those calibration with fees of $1000 or more, only 9 percent were included on the original E01 (see Figure 62).

**Manual Calibration Entries Included in CY2017-CY2019 Appraisals — Percent Included per Estimate Version**

<table>
<thead>
<tr>
<th></th>
<th>E01</th>
<th>S01</th>
<th>S02</th>
<th>S03-S99</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Manual Calibration Entries</td>
<td>37.3%</td>
<td>36.7%</td>
<td>37.6%</td>
<td>31.7%</td>
</tr>
<tr>
<td>Manual Calibration Entries =&gt;$1000</td>
<td>9.0%</td>
<td>16.4%</td>
<td>9.3%</td>
<td>22.0%</td>
</tr>
</tbody>
</table>

**Driving Change for Collision Repairers**

Changes to both the material composition of the vehicle and the added procedures to account for repairs of new software and electronic components also mean repairers must make significant investments in added tooling and training and staff for their locations. Purchasing the tools and software specified by each individual OEM results in multiple software license fees, multiple welders, rivet guns, scan tools, calibration targets and more. As shops struggle to keep up with the necessary investments, they face the reality that they may not be able to repair every vehicle from every OEM in the future. This is just one of many major decisions that must be made by repairers today. Others include whether to participate in insurers’ direct repair programs, whether to expand, sell or join a franchise or banner group, and whether to become an OEM certified shop, and if so, which OEM(s).

Many more OEMs are developing their own OEM certified repair programs that require varying levels of ASE certification, I-CAR training, I-CAR welding certification, and specific tool and equipment. The programs are designed to help drive brand recognition, customer satisfaction with service and repair, keep OEM warranties in place, and ensure eligible trade-ins and lease returns meet requirements for certified pre-owned programs. As vehicle complexity grows, OEMs are increasingly focused on encouraging the repairer community to review the OEM repair procedures prior to repairing a vehicle.

Over the last several decades, repairers have faced numerous challenges from changing vehicle technology. The pace of change among vehicles today is accelerating, driving up the costs of operating a professional facility. Not surprisingly, the collision repair industry also is transforming. Between CY 2007 and CY 2013, nearly 4,000 collision repair facilities in the U.S. went out of business, with just over 41,000 in operation as of CY 2018 (see Figure 63). In recent years, the number of independent body shops has grown nearly 5 percent annually as economic recovery, miles driven, extreme winter weather, and improved new vehicle sales began to support increases in auto accident frequency. Overall, however, growth within the segment over the last 15 years has seen a compound annual growth rate of -0.5 percent. These independent repairers and dealer body shops will do an estimated $41 billion in collision repair work in 2019, a number anticipated to grow further over the next several years. The Romans Group estimates 89 percent of the overall collision repair revenue is insurance paid, while 11 percent is consumer paid.

Analysis of the auto claims processed by CCC on behalf of its insurance and collision repair customers reveals the percent of appraisals generated at a shop on behalf of an insurance company was 47.1 percent for CY 2019, after peaking at 49.7 percent in CY 2017 (see Figure 64). DRP share of repairable appraisal volume was 39.9 percent for CY 2019, down from 40 percent in CY 2016 and CY 2017 as more carriers shifted volume for customers among various methods of inspection options such as photo/virtual estimating.

Analysis of repairable DRP volume reveals national MSOs continue to see significant growth in share. Between CY 2000 and CY 2019 the share of overall repairable DRP appraisal count going to national MSO’s quadrupled, growing from 5.8 percent to 39.1 percent (see Figure 65). Share of DRP appraisal volume going to dealers was 3.3 percent in CY 2019. According to Supplement Advisory, dealerships share of the overall U.S. collision market dollars was just below 20 percent as of Q1 2019, trailing chain and franchise shops at 26.6 percent, and independent stores at 54.1 percent.
DRP Repair Cycle Times Continue to Grow While Repairer Productivity Slows

When an insurance vehicle claim is made, insurance carriers often have limited visibility into whether their customer gets the vehicle repaired or not, and if so, where. The exception to this is claims where the vehicle is repaired at a collision repair facility that is part of that carrier’s direct repair program (DRP). Through updates provided by the repairer to the insurer, data on repair cycle times, and repair satisfaction is available.

The percent of DRP appraisals written that convert to repairs tends to be higher as the repair cost rises (see Figure 66). For the period of Q4’18-Q3’19, 70.3 percent of all repairable DRP appraisals converted to repairs. Separate analysis of the capture rate (estimates written to repair orders captured) for repairers’ walk-in business reveals just over 50 percent of walk-in business converts to repairs, and the average cost per walk-in repair order averaged nearly 30 percent less than DRP repairs.

Between Q4’16-Q3’17 and Q4’18-Q3’19, the average DRP repair cost rose from 8.3 percent from just over $3,000 to $3,251. A comparison of repairs by repair cost dollar range shows the shift toward the higher dollar ranges over the same period (see Figure 67). Over the same two-year period, the average number of days from vehicle drop-off to vehicle pickup, or ‘keys-to-keys’ has increased from 9.7 days to 10.2 days (see Figure 68). Consistent with prior analysis, the vehicle in to repair started days average and the repair complete to vehicle out days average have improved or stayed steady — the increase has occurred within the repair time itself.

With OEMs increasingly pursuing growth of their own certified collision repair networks, dealer share of volume may grow.
Among the data that further illustrates the impact of greater complexity in vehicle repair are the following. The percent of vehicle repairs with at least one supplement has grown from 76 percent to 82 percent over the three year period from Q4'16-Q3'17 to Q4'18-Q3'19; the share of total repair cost added during supplements grew from 12 percent to 14.5 percent; average labor hours per repair grew from 25 hours to 25.4 hours; and parts share of overall repair cost grew from 41 percent to 42 percent with average parts replaced per repair growing from 11.5 to 12.8 parts (see **Figure 69**).

Unfortunately, as complexity has grown, repairer productivity has declined. Labor hours per repair day and labor hours per shop day have both fallen over the last three years, with some of the most significant declines among the lower dollar repairs (see **Figure 70**). Worth noting is the growing share of overall spend on the ‘Miscellaneous percent of Total Repair Cost’ where most of the additional fees for scan and calibration roll up — suggesting these fees are adding to costs across repairs of all dollar ranges (see **Figure 71**). As noted above, as of Q4 CY 2019, 49.5 percent of all appraisals included an entry for a pre-, post-, or in-process vehicle scan, with an average fee of $68 per scan, and an average of $85 per claim.

<table>
<thead>
<tr>
<th>Period</th>
<th>Avg Total Cost of Repairs</th>
<th>% Change in Avg T-COR Versus Prior Year</th>
<th>% of Appraisals with Supplement ($)</th>
<th>Supplements % of Total Repair Cost</th>
<th>Avg Labor Hrs per Appraisal</th>
<th>Parts % of Total Repair Cost</th>
<th>Avg # of Parts Replaced per Appraisal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4'16-Q3'17</td>
<td>$3,003</td>
<td>RI/A</td>
<td>76.3%</td>
<td>12.2%</td>
<td>25.0</td>
<td>40.94%</td>
<td>11.5</td>
</tr>
<tr>
<td>Q4'17-Q3'18</td>
<td>$3,078</td>
<td>2.5%</td>
<td>75.1%</td>
<td>13.2%</td>
<td>25.0</td>
<td>41.30%</td>
<td>11.9</td>
</tr>
<tr>
<td>Q4'18-Q3'19</td>
<td>$3,251</td>
<td>5.6%</td>
<td>82.3%</td>
<td>14.5%</td>
<td>25.4</td>
<td>41.75%</td>
<td>12.8</td>
</tr>
</tbody>
</table>

**DRP Repairs Key Repair Metrics Illustrating Growing Repair Complexity**
(FIGURE 69) **SOURCE:** CCC INFORMATION SERVICES INC., CCC NATIONAL INDUSTRY

| Repair Cycle Time — Average Days — DRP Repairs (FIGURE 68) **SOURCE:** CCC INFORMATION SERVICES INC., CCC NATIONAL INDUSTRY |
|-----------------------------------------------|-----------------------------------------------|
| **Repair Cost Range** | **Q4'16-Q3'17** | **Q4'17-Q3'18** | **Q4'18-Q3'19** | **3 Year Change** |
| $0.01-$500.00 | 0.3 | 0.5 | 0.8 | 0.0 |
| $500.01-$1,000.00 | 0.3 | 0.5 | 0.5 | 0.0 |
| $1,000.01-$2,000.00 | 0.5 | 0.5 | 0.5 | 0.0 |
| $2,000.01-$3,000.00 | 0.8 | 0.6 | 0.8 | 0.0 |
| $3,000.01-$4,000.00 | 1.1 | 0.9 | 0.9 | 0.0 |
| $4,000.01-$5,000.00 | 1.4 | 1.1 | 1.1 | 0.0 |
| $5,000.01-$10,000.00 | 2.1 | 1.6 | 1.5 | 0.0 |
| $10,000.01 & Up | 3.7 | 2.5 | 2.2 | 0.0 |
| Total | 1.0 | 0.7 | 0.0 | 0.0 |
As more repairs include additional steps previously included infrequently or not at all, the importance of clear processes to ensure these steps are completed properly and thoroughly, and clearly documented, grows. Blueprinting the repair, identifying up front what types of electronic components such as ADAS may require calibration, completing scans, etc. have all become more important up front to understand as much about the likely repair cost and repair time for each individual vehicle. As repair costs rise, supplement frequency and return rates rise, while on-time delivery rates fall. Creating and following a standard set of procedures up front to remind estimators and repair technicians to check for items such as ADAS features may help combat the inevitable increases in each of these as repair costs continue to rise (see Figure 72).
As Repair Costs Have Risen, So Too Has Total Loss Frequency

Higher vehicle repair costs and longer-lasting vehicles are key factors behind the continued increase in vehicle total loss frequency. The percent of vehicle appraisals flagged total loss has grown from 14 percent in CY 2013 to 19.2 percent in CY 2019 (see Figure 73). Total loss frequency for non-comprehensive losses has risen nearly 5 full percentage points during that same period, with vehicles four years and younger seeing the largest growth rate over the last five years (see Figure 74).

<table>
<thead>
<tr>
<th>Percent of Vehicle Appraisals Flagged Total Loss CY2013-CY2019 (FIGURE 72)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source: CCC Information Services Inc., CCC National Industry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Comprehensive Losses</td>
<td>0.0%</td>
<td>5.0%</td>
<td>10.0%</td>
<td>15.0%</td>
<td>20.0%</td>
<td>25.0%</td>
<td></td>
</tr>
<tr>
<td>All Loss Categories</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

With younger vehicles experiencing some of the largest growth in total loss frequency, the average age of total loss vehicles has started to decline. The younger mix, as well as continued shifts towards more expensive vehicles such as light trucks and non-domestic vehicles, drove up the average total loss adjusted vehicle value in CY 2019 (see Figure 75).

Total Loss Valuations — Vehicle Mix Statistics by Calendar Year (FIGURE 75)

Source: CCC Information Services Inc., CCC National Industry

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$8,867</td>
<td>$8,943</td>
<td>$9,272</td>
<td>$9,125</td>
<td>$9,500</td>
<td>$9,861</td>
</tr>
<tr>
<td>% Chg from prior year</td>
<td>1.7%</td>
<td>0.9%</td>
<td>3.7%</td>
<td>2.0%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Avg Vehicle Age</td>
<td>10.01</td>
<td>9.87</td>
<td>9.64</td>
<td>9.73</td>
<td>9.66</td>
</tr>
<tr>
<td>Avg Odometer</td>
<td>119,079</td>
<td>116,839</td>
<td>113,965</td>
<td>114,768</td>
<td>114,196</td>
</tr>
<tr>
<td>Avg Mileage per Vehicle Year</td>
<td>11,894</td>
<td>11,834</td>
<td>11,817</td>
<td>11,800</td>
<td>11,822</td>
</tr>
<tr>
<td>Light Trucks % Vol</td>
<td>36.3%</td>
<td>36.6%</td>
<td>37.7%</td>
<td>37.5%</td>
<td>38.7%</td>
</tr>
<tr>
<td>SUV's % Vol</td>
<td>19.9%</td>
<td>20.7%</td>
<td>22.2%</td>
<td>22.0%</td>
<td>23.3%</td>
</tr>
<tr>
<td>Car Final Val Amt Avg</td>
<td>$8,129</td>
<td>$8,042</td>
<td>$8,143</td>
<td>$8,041</td>
<td>$8,231</td>
</tr>
<tr>
<td>% Chg from prior year</td>
<td>0.6%</td>
<td>-1.1%</td>
<td>1.3%</td>
<td>0.0%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Truck Final Val Amt Avg</td>
<td>$10,164</td>
<td>$10,506</td>
<td>$11,133</td>
<td>$10,925</td>
<td>$11,508</td>
</tr>
<tr>
<td>% Chg from prior year</td>
<td>3.3%</td>
<td>3.4%</td>
<td>6.0%</td>
<td>4.0%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Collision %</td>
<td>62.9%</td>
<td>61.0%</td>
<td>59.9%</td>
<td>61.3%</td>
<td>62.8%</td>
</tr>
<tr>
<td>Comprehensive %</td>
<td>25.9%</td>
<td>24.5%</td>
<td>23.7%</td>
<td>24.8%</td>
<td>22.4%</td>
</tr>
<tr>
<td>Liability %</td>
<td>11.2%</td>
<td>14.5%</td>
<td>23.4%</td>
<td>23.9%</td>
<td>23.0%</td>
</tr>
<tr>
<td>Collision Adj Vehicle Value Avg</td>
<td>$9,817</td>
<td>$9,806</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$10,399</td>
</tr>
<tr>
<td>Comprehensive Adj Vehicle Value Avg</td>
<td>$8,833</td>
<td>$9,080</td>
<td>$10,036</td>
<td>$9,357</td>
<td>$9,576</td>
</tr>
<tr>
<td>Liability Adj Vehicle Value Avg</td>
<td>$5,174</td>
<td>$5,906</td>
<td>$6,067</td>
<td>$6,067</td>
<td>$6,136</td>
</tr>
<tr>
<td>Asian Vehicles % Vol</td>
<td>45.4%</td>
<td>47.2%</td>
<td>48.4%</td>
<td>48.5%</td>
<td>49.5%</td>
</tr>
<tr>
<td>Domestic Vehicles % Vol</td>
<td>46.2%</td>
<td>47.2%</td>
<td>47.7%</td>
<td>47.6%</td>
<td>47.6%</td>
</tr>
<tr>
<td>European Vehicles % Vol</td>
<td>8.4%</td>
<td>8.7%</td>
<td>8.9%</td>
<td>9.0%</td>
<td>9.4%</td>
</tr>
<tr>
<td>Asian Veh Final Val Amt Avg</td>
<td>$9,028</td>
<td>$8,941</td>
<td>$9,051</td>
<td>$8,943</td>
<td>$9,202</td>
</tr>
<tr>
<td>% Chg from prior year</td>
<td>-0.2%</td>
<td>-1.0%</td>
<td>1.2%</td>
<td>0.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Domestic Veh Final Val Amt Avg</td>
<td>$8,038</td>
<td>$8,270</td>
<td>$8,769</td>
<td>$8,608</td>
<td>$9,118</td>
</tr>
<tr>
<td>% Chg from prior year</td>
<td>3.2%</td>
<td>2.9%</td>
<td>6.0%</td>
<td>4.1%</td>
<td>5.9%</td>
</tr>
<tr>
<td>European Veh Final Val Amt Avg</td>
<td>$12,175</td>
<td>$12,162</td>
<td>$12,944</td>
<td>$12,580</td>
<td>$12,879</td>
</tr>
<tr>
<td>% Chg from prior year</td>
<td>1.5%</td>
<td>-0.1%</td>
<td>6.4%</td>
<td>3.4%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Theft % Vol</td>
<td>1.4%</td>
<td>1.4%</td>
<td>1.3%</td>
<td>1.4%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Vehicles Current Yr or Newer %</td>
<td>2.4%</td>
<td>2.5%</td>
<td>2.6%</td>
<td>2.5%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Vehicles 1-3 Years %</td>
<td>11.8%</td>
<td>12.3%</td>
<td>14.1%</td>
<td>14.1%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Vehicles 4-6 Years %</td>
<td>12.2%</td>
<td>14.0%</td>
<td>16.2%</td>
<td>16.0%</td>
<td>17.8%</td>
</tr>
<tr>
<td>Vehicles 7 Years &amp; Older %</td>
<td>73.6%</td>
<td>70.3%</td>
<td>66.8%</td>
<td>67.4%</td>
<td>65.4%</td>
</tr>
<tr>
<td>Luxury % Vol</td>
<td>13.7%</td>
<td>14.1%</td>
<td>14.5%</td>
<td>14.5%</td>
<td>14.4%</td>
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</table>
A shifting vehicle mix also contributed to higher vehicle repair costs. Over the last 10 years, the share of vehicle claims volume per repair cost dollar range has shifted to the higher repair brackets just as it has for vehicle repairs discussed above (see Figure 76). Unfortunately, as the repair cost rises, so too does the likelihood that the vehicle will be a total loss. While less than 10 percent of vehicle appraisals with repair cost of $3,000 or less were flagged total loss, that number jumped to over 60 percent for those with repair cost of $10,000 or more.

Crash tests conducted by organizations such as Thatcham, IIHS/HLDI, and automakers themselves, suggest that, over time, the prevalence of ADAS may help to reduce accident frequency, and reduce claim severity. Despite most of the ADAS designed to avoid specific types of accidents up to certain speeds, there is some hope that more of the higher speed, higher impact crashes could be mitigated by these systems. This could potentially stabilize repair costs and total loss frequency for newer models over time. Repairer productivity for ADAS-equipped vehicle repairs will improve over time, and the cost of the technologies may stabilize. Near term, however, the industry can expect fewer but more expensive repairs.

Repairable Non-Comprehensive Appraisal Volume Shifts to Higher Cost Repairs

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</tr>
</thead>
<tbody>
<tr>
<td>$0.01-$500.00</td>
<td>$500.01-$1K</td>
<td>$1,000.01-$2K</td>
<td>$2,000.01-$3K</td>
<td>$3,000.01-$4K</td>
<td>$4,000.01-$5K</td>
<td>$5,000.01-$6K</td>
<td>$6,000.01-$7K</td>
<td>$7,000.01-$8K</td>
<td>$8,000.01-$9K</td>
</tr>
</tbody>
</table>

Bodily injury severity and social inflation continue to be concerns as we head into a new decade. The ability to implement solutions to moderate these severity trends will be key for any carrier hoping to grow market share profitably. We have a duty to our policyholders to solve rate inflation driven by extreme trends. One way: reaching out to legislators and working together to discourage legal frameworks that magnify social inflation and bodily injury severity.

Autonomous vehicles and ADAS technology will have a significant impact on the insurance model. Quickly developing accurate pricing models will give a carrier a significant competitive advantage. This technology also creates an opportunity to build a telematic data-sharing environment that could reduce accident rates and drive an improved experience for insureds and insurers alike.

Privacy concerns are real and must be accounted for as we approach critical mass in our ability to leverage telematic data. There’s vast potential to scientifically and credibly predict the causes and likelihood of bodily injuries. Pricing, claims, and underwriting functions can all benefit from more accurately pricing risks and predicting driver behavior. The consumer can also benefit from paying rates which match their driving behavior and usage — and therefore, their risk.

Michele Dufresne
Chief Claims Officer
Sentry Insurance

What are we thinking about?
When I was hired by CCC as the Vice President of Quality Repair and Market Development, the position did not previously exist. The company decided to create a role within the organization signifying the importance and CCC’s commitment to support customers’ desire for consistent, quality repairs. What role can an information provider play in repair quality? The obvious and easy answer is information, but the more complex answer is delivering solutions that assist industry stakeholders — repairers, insurers, independent appraisers, OEMs, and part suppliers — throughout the process. It starts with the first notice of accident (FNOA) and continues through repair planning, repairing the vehicle and finishing with the delivery of the vehicle to the owner. Why was this role created? Our customers’ needs have changed as vehicle technology has rapidly evolved. Today’s car isn’t the 1983 Oldsmobile 88 that I repaired in my dad’s shop 30 years ago. In the 80’s, the industry wasn’t as advanced and most of us were satisfied with the advent of computers and electronic estimating. Remember when EzEst was the next big thing? We have come a long way since those days.

When you hear the words “repair quality” it is logical to automatically default to thinking of the vehicle repair at the collision repair facility. I am going to challenge that thinking and conditioned response. Repair quality doesn’t start when the technician disassembles the vehicle. Repair quality starts before the vehicle arrives at the collision repair facility.

When a vehicle is in an accident, the first notice of loss (FNOL) historically involves the insured notifying their insurance agent and filing a claim. Today, the technology in many vehicles is changing that paradigm: FNOL is now the FNOA. CCC’s announcement regarding our partnership with Volvo Cars is a great example of this shift. In these situations, the car manufacturer is the first entity notified of an incident. This is the beginning of the “repair quality” chain and a philosophical change to the claims handling process. The industry was accustomed to being reactionary, waiting for the customer to notify the insurance company. Today, technology is enabling the car manufacturer to immediately reach out to the vehicle owner, verify if the occupant(s) are OK, and provide CCC products which capture pertinent information at the scene of the accident and allow the vehicle owner to notify their insurance carrier of their accident and schedule an appointment to begin repairs. All of this can be completed before the vehicle owner leaves the scene of the accident. In theory, the collision repairer could order the parts for this vehicle before it arrives on their premises. Conversely, the insurance carrier could assess if the vehicle was likely a total loss based upon the images captured at the accident scene. These are just a few examples as to how technology is helping to deliver a quality repair and better customer experience.

Once the vehicle arrives at the shop, the various touch points impacting the quality of the repair grow exponentially. During the repair plan process, it is critical to identify the advanced driver assistance systems (ADAS) adversely impacted and repair procedures for the damaged parts, while simultaneously documenting these steps for repair quality and consistency. The use of products such as Repair Methods provides the user with repair procedures once the decision to make a repair or replace a part has been made.

Throughout the repair process, it has become an essential part of every repair to document the 5 Ws (who, what, when, where and why).

Who performed repairs on the vehicle?
- Identify the technician who performed the scanning and calibrations.
- Identify the technician who performed the sectioning and welds.

What repairs were completed?
- Capture images of all the work performed throughout the repair process.
- Document quality control procedures and identification as to who verified the quality.

When were the repairs completed?
- Document when or if pre- and post-repair scanning was performed.
- Document dates and time stamps of the repair.
Continued

A NEW ROLE

Where were the repairs completed?
• Identify the location of the sectioning performed
• Identify welds, welding and/or bonding procedures locations.

Why were specific repairs completed or not performed?
• Document the decision-making process including unrelated damage that was not repaired.

To assist repairers in documenting the 5 Ws, we offer a product called CCC® Checklist. In my opinion, every shop in the country should be using a product like Checklist. It gives the shop owner information when questions arise regarding a repair and provides the shop an opportunity to audit repairs and an opportunity to coach their technicians in real time.

We recognize the need for collision repairers to have documentation that supports the entirety of the repair. This documentation is necessary at the time of the repair, and it may be even more important after their customer leaves the repair facility.

Remember, repairers, insurers, independent appraisers, OEMs, and part suppliers all help in providing a seamless experience in repairing vehicles. CCC remains committed to building, enhancing and delivering products that meet the needs of the industry today with a watchful eye to the future.

Scott Kohl
Vice President & Manager, APD Field Operations, Global Retail Markets
Liberty Mutual Insurance

How do you/your company spend your time?

“At Liberty Mutual, we spend a lot of our time thinking about innovation and how we can transform our customers’ experience with us. Consumer expectations for service and personal transportation are changing and along with that, we’re changing to modernize what we can deliver and how we deliver it.”
With new vehicle sales exceeding 17 million each year for the past five years, many more insurance claims and vehicle repairs are for newer model year vehicles. As of CY 2019, vehicles of model years 2016 through 2020 accounted for 34.4 percent of all appraisals generated (including those flagged total loss), and for 42.7 percent of those repaired (see Figure 77). Many of these vehicles include options such as automatic braking, crash warning or avoidance systems, parking assist, lane departure warning, and more. Unfortunately, when a vehicle is equipped with these features, additional repair requirements related to them may also be driving up repair costs and subsequently total loss frequency.

More than ever before it is essential for the automotive claims and collision repair industries to stay current on new technologies, tooling, and training. Ensuring the vehicle repair is completed in a manner that follows recommended repair procedures can also head off any potential unplanned returns of the vehicle and leave the ever-more demanding customer with a more expensive and longer repair time than anticipated.

Repairing a vehicle and ensuring it is returned to its owner in pre-accident condition has never been easy. As more computers, sensors, substrate metals, new welding and joining techniques, and more are added to vehicles, the repair process has become even more challenging. Each vehicle accident is different and has its own unique characteristics. Repairers must subsequently develop a unique set of steps or repair plan for each individual repair. With additional requirements based on the construction and electronic content of the vehicle itself, the insurance company, OE certified program, and/or any regulatory requirements for documentation, there could be potentially millions of combinations of process steps required to properly complete a repair. Ensuring processes exist to check-off and document the specific steps required for each type of repair has become more important than ever — not only to complete a proper repair, but to also have the documentation to prove it.

The sharp drop-off in new vehicle sales that occurred with the last recession slowed the pace at which new automotive technology hit the street.
Rising repair costs, higher total loss frequency and costs, and longer repair times have added more pressure to an industry struggling to keep up with growing consumer demand to turn an unpleasant, disruptive experience into a satisfying one.
Data from numerous surveys on customer service delivery across all industries reveals 75 percent of consumers feel self-service is a convenient way to address customer service issues, and 67 percent prefer self-service over speaking to a company representative (see Figure 79). However, there is a key difference depending on the type of interaction: customers may prefer the use of self-service tools for transactional-type activities, but still value personal contact with an agent or service representative for high-value interactions regarding price and policy coverage and first notice of loss.

Consumers Prefer Self-Service Over Speaking to Company Representative

(FIGURE 79) | SOURCES: NUANCE ENTERPRISE SURVEY AND COLEMAN PARKES FOR AMDOCS STUDY (HTTPS://WWW.ZENDESK.COM/RESOURCES/SEARCHING-FOR-SELF-SERVICE/)

While consumers are eager to embrace their favorite brands’ online self-service capabilities, another study by Coleman Parkes for Amdocs points out self-service is only an option if it’s done right. A recent consumer survey commissioned by Nuance Enterprise found that a majority of respondents thought positively about self-service. Consumers expect support of a digital experience from their insurance companies in claims, policy updates, insurance shopping, etc., and improved access to these has helped drive auto insurance customer satisfaction to its highest level since CY 2000 (see Figure 78).


Insurers Use Digital to Improve the Claims Experience

The numerous components, steps, and players involved in a vehicle accident and claim can be confusing, disconnected, and subsequently dissatisfying. Process improvements alone don’t close this satisfaction gap. Research continuously shows the power of insurance companies’ customer communication and engagement. Over the last several years, carriers invested a great deal in technology designed to improve these areas. Improvements to their websites, more self-service and mobile capabilities are just some of the areas of focus.

According to the J.D. Power 2019 Auto Insurance StudySM, the most important components of the insurance companies’ customer experiences are clear delivery and transparency around premium increases, delivery of functional digital self-service tools, and quality customer service. Consumers expect support of a digital experience from their insurance companies in claims, policy updates, insurance shopping, etc., and improved access to these has helped drive auto insurance customer satisfaction to its highest level since CY 2000 (see Figure 78).

J.D. Power 2019 Auto Insurance StudySM Auto Insurance Customer Satisfaction Index (on a 1,000 point scale)

(FIGURE 78) | SOURCE: LAJDZIAK, ROBERT M. “HIGH CUSTOMER SATISFACTION LEADS TO NEW CHALLENGES FOR INSURERS.” SEPTEMBER 18, 2018. HTTPS://WWW.CARRIERMANAGEMENT.COM/FEATURES/2018/09/18/184296.HTM.

This means the majority of calls to the call center can be dramatically reduced, if brands provide specialized self-service, which customers prefer.
As auto premiums increased, many consumers opted to shift to higher dollar deductibles. A comparison of all vehicle claims submitted as a collision loss between CY 2001 and 2019 underscores this shift as claims with a deductible greater than $500 has grown from 3.8 percent to 22.5 percent (see Figure 80).

Volume Share per Deductible Dollar Range — Vehicle Claims, Collision Loss Category C2001-CY2019 (FIGURE 80) | SOURCE: CCC INFORMATION SERVICES INC., CCC NATIONAL INDUSTRY

As deductibles rise, and even minor repairs become expensive, many consumers are unsure at the time of loss whether to have their vehicle repaired. A comparison of collision claims by the method of inspection (MOI) for the initial estimate of record (E01) and deductible range raises an interesting question. Are consumers with higher dollar deductibles more willing to have their initial inspection done by the insurer versus a shop? And, conversely, are those consumers with lower deductibles more willing to take their vehicle to a shop from the outset (see Figure 81)? While we don’t know how much the deductible factors into consumers’ choice of method of inspection, comparison of the volume of appraisals written per dollar range by inspection type suggests nearly 30 percent of photo appraisals fall below $1,000 (including any supplement changes), and nearly 60 percent fall below $2,000 (see Figure 82). Customers choosing photo MOI in CY 2019 received their estimate, on average, in 1.4 days, versus 4.5 days across all MOIs. With photo MOI, insurers provide expedited information to those insurance companies’ customers who may be unsure about repair of their vehicle due to deductible or other reason (see Figure 83). Transparency provided with fewer steps is a key benefit of this digital experience.
Customer retention is a huge benefit gained from improving digital channel experiences, yet there are additional benefits that help insurance carriers with their loss adjustment expenses. Data from J.D. Power 2019 U.S. Auto Claims Satisfaction Survey reveals that insurers improved or remained consistent on all factors that comprise the total claim satisfaction score: first notice of loss, claim servicing, estimation process, repair process, rental experience, and settlement.\(^{[140]}\) Faster cycle time across the entire claim — from making the second contact after first notice of loss, making the initial estimate, sending the vehicle to the repair facility, informing the customer of a settlement offer, and making the initial payment.\(^{[141]}\) From the 2017 and 2018 studies, J.D. Power found satisfaction with the estimation process rose from 859 to 871 if insurers used the photos or videos provided by the customer, but if the carrier still had to send out an adjuster, satisfaction fell to 839 (see Figure 84).

**J.D. Power Auto Claims Satisfaction by MOI (2017 + 2018)**

(Source: SCHMITT, KYLE. “WHY CARRIERS STRUGGLE TO DIFFERENTIATE WITH DIGITAL AND END UP PAYING A PENALTY.” WWW.JDPOWER.COM, MAY 31, 2019.)

<table>
<thead>
<tr>
<th>MOI Type</th>
<th>Photo Estimate Only</th>
<th>Traditional MOI</th>
<th>Tried Photo Estimate, but needed traditional MOI</th>
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</thead>
<tbody>
<tr>
<td>Index</td>
<td>871</td>
<td>853</td>
<td>862</td>
</tr>
<tr>
<td>FNOL</td>
<td>866</td>
<td>851</td>
<td>861</td>
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<td>Estimation</td>
<td>871</td>
<td>859</td>
<td>866</td>
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<tr>
<td>Body Shop</td>
<td>871</td>
<td>859</td>
<td>861</td>
</tr>
<tr>
<td>Rental Car</td>
<td>871</td>
<td>859</td>
<td>862</td>
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<tr>
<td>Claim Servicing</td>
<td>870</td>
<td>858</td>
<td>867</td>
</tr>
<tr>
<td>Settlement</td>
<td>865</td>
<td>862</td>
<td>854</td>
</tr>
</tbody>
</table>

**Growth within the hyper-competitive private passenger auto insurance market remains a challenge.** Market share continues to shift to the top 10 carriers (see Figure 85), and data prepared by CB Insights reveals the number of property & casualty insurance filers between 2008 and 2018 fell nearly 10 percent (see Figure 86), and only 71 carriers have net written premiums of more than $1 billion.\(^{[142]}\)
Digital experiences infused with photo and AI can help insurers at first notice of loss better identify whether the vehicle is likely repairable or not, and identify what is the most appropriate MOI based, in part, on their customer and vehicle characteristics. For example, CCC Smart Total Loss™ solution can help insurers more accurately predict if a vehicle is likely repairable or a total loss with a single photo. And, the CCC’S Smart Estimate solution applies CCC’s estimating logic and AI to vehicle collision photos to predict repair requirements and suggest estimate lines — including parts likely required to complete the repair — for human estimators to review, edit, and advance. As vehicles become more connected, the data from the vehicle itself may supplement digital technology such as photos, and AI, to enhance decision-making precision and further streamlined claims processes. Insurers want and need to make things simple for their customers but have limited opportunities given the nature of the product they are selling. Claims is a key opportunity — but the challenge is there are numerous entities that must be relied on to deliver a quality experience — whether that is the repairer, the rental car company, the parts supplier, etc.

Understanding which technologies to implement and how to implement to help with the handoff between parties and to manage the performance of those business partners is a challenge. Enabling processes to support those handoffs becomes critical as insurance companies’ consumers expect the claims experience to be as seamless as ordering something on Amazon. The key difference is the accident was not an experience the consumer chose. Technology helps reduce the time spent by claims processors on the mundane, administrative nature of claims, frees them up and enables them to spend more time on the human-touch, customer-service-oriented aspects of claims processing that technology can’t yet (and may never) replace. Providing the human support and empathy at the right points while facilitating the digital experience remains job one.

Transparency of Repair

Repairs are central to delivering consumer claim satisfaction and continue to embrace tools and processes to meet expectations. With National Safety Council data reporting accident frequency per driver in the U.S. at 11 percent in 2017, very few consumers have regular or repeated experience with a vehicle accident and subsequent repair. Among the top reasons that a consumer selects a collision repairer per data from IMR Inc.’s are ‘Good Prior Experience’ (32.6 percent), ‘Recommendation’ (13.1 percent), and ‘Convenient Location’ (12.4 percent). Compare this to broader consumer survey data showing who internet users trust for recommendations and what becomes clear is repairers must rely more than ever on good reviews from prior repairers’ customers by word of mouth or via online reviews (see Figure 87). Analysis of customer satisfaction data conducted by CCC shows quality repairs and few returns lead to higher scores; yet, if the shop wants positive customer recommendations, it needs to make sure the service is great and customers are kept informed. In other words, quality is table stakes — service gets repeat business.

In order to better understand whether there are characteristics of repairs where the customer returns the vehicle for additional work post repair pickup, CCC completed analysis of collision loss front impact DRP repairs from Q1 CY 2019 (time period selected to allow for customers to have time to use vehicles post vehicle pick-up) Figure 88 provides a comparison of metrics that illustrate several differences among the 10.6 percent of the repairs returned to the repairer after the vehicle...
In 2010, Gartner reported that 36 percent of companies competed primarily on the basis of customer experience. In 2020, that number is 90 percent. Nine of ten companies compete on the experience they deliver to a customer every day. This means that how you deliver on your customer’s expectations is what matters, and it’s more important than the price you charge.

In the aftermath of a vehicle accident, the idea of customer experience resonates. Consumers want and expect the claims vehicle repair or settlement process to be empowering, seamless, convenient, transparent, trustworthy, and responsive. So, what do collision market stakeholders need to be thinking about to deliver a great consumer experience and to be differentiated in the marketplace? Several things, including:

• Being customer-centric and evaluating the effectiveness of every touchpoint—online, on phone, and in-store.
• Having a mobile-first (digital) approach to engagement that seamlessly connects to in-store and on phone engagements.
• Collecting and analyzing customer feedback and integrating processes to close the gaps on failed engagements and continually reinforce good behavior.
• Developing ways for consumers to help themselves, meeting the 67 percent of consumers who prefer self-service over speaking to a company representative.
• Focusing on outcomes that result in quality, trust, transparency, and convenience.

And, in this day of mobile, digital, AI-infused engagement, this last element often means a human touch. As much as customers appreciate a seamless, connected, digital experience—they want it personal and curated and they want to have a human accessible in the event things break down.

Establishing Trust

In 2019, CCC partnered with Magid, a consumer experience research firm, to perform a benchmark study on the state of collision repair. This study included 2,000 primary decision makers who experienced a collision repair in the previous 24 months and was representative of the U.S. population. From the study, there was one attribute that floated to the top in terms of importance in creating a satisfying consumer experience—trust. The study found that ‘trust’ was ranked as the most important element in selecting a repair facility, and the element of trust also carried through to the repair and return of the vehicle.

It’s easy to understand why trust is such an overwhelming component of satisfaction in collision repair. First, repair is a personal experience. For 90 percent of repairs, the vehicle is the primary vehicle in the household. 75 percent are owned (not leased), and 70 percent of consumers are using a shop for the first time. It’s disruptive and inconvenient, and with new cars costing more than $35,000 and being the second most expensive household expense, getting it repaired right is important.

Time needs to be taken with each repair to help the owner/consumer understand:

• What does the consumer know about today’s repair process and claims process? The consumer experience should build knowledge and confidence.
• What is damaged, how it will be repaired, and why is that important? The consumer experience needs to deliver transparency. Providing an estimate is the first step but explaining the estimate and answering every question a consumer has is critical. An experienced estimator can proactively answer questions and take the time to ensure the customer understands the severity and complexity of repair—and the intricacies of restoration.
• Why is the shop qualified to do the repair and who will be repairing it? The consumer experience needs to integrate authenticity and familiarity. Shops spend a lot of time training technicians, securing certifications, and investing in equipment to perform high-quality repairs. It’s worth it to take time to explain what the relevant plaques on the

The (Magid) study found that ‘trust’ was ranked as the most important element in selecting a repair facility, and the element of trust also carried through to the repair and return of the vehicle.”
CUSTOMER EXPERIENCE TAKES CENTER STAGE

Delivering on a customer experience that checks all of these boxes requires a customer experience strategy that simultaneously improves your business in three areas.

- Hiring and developing the right people at all levels of the organization. Your people are the lifeblood of your organization. Create a culture of trust and accountability and empower them to fulfill their role.
- Creating and rigorously following the right processes to deliver a consistent experience whether you are one location or hundreds of locations. Every business has its secret sauce for how it operates to deliver exceptional experiences. Scaling process to deliver consistent experiences may be difficult as location numbers increase, acquisitions happen, and employee turnover occurs.

An industry executive once told me that successful digital transformation to evolve the consumer experience is like trying to change all four tires on a car that’s rolling down the highway at 65 miles an hour. There are lots of moving parts and you can’t pause your business to make the changes. You are trying to align your people, evolve your processes, and integrate your technology — all while innovation throws new things at you at an ever-increasing pace.

An area of focus at CCC is to help our customers keep the arrow aimed at their consumer empowered and connected across the journey?

Integrating the proper technology that complements the people and process and enables the organization to achieve desired outcomes. The latest trends are systems and applications that connect seamlessly. As first notice of loss becomes a claim, and a claim becomes a repair, and repair becomes a restored vehicle, how are all of those activities and touchpoints between insurer, repair facility, and OEM handled? How is the consumer empowered and connected across the journey?

Interestingly, the average vehicle model year for vehicles returned was 2013.8 versus 2013.7 for those not returned, and distribution by vehicle age group was also nearly identical. Roughly 39 percent of repairs for both vehicles returned and not returned were for model years 2016-2019. The average repair cost, higher supplement frequency, higher parts replacements, longer overall cycle time, and lower shop productivity suggest these were more complex repairs than those repairs not returned.

Not surprisingly, distribution of repairs returned by dollar range skewed towards the higher dollar repairs (see Figure 89).
process was central to customer satisfaction. Conducted with the research firm Magid, the ability to deliver transparency throughout the repair process could help repairers set and better manage customer expectations. In the consumer survey, the success of the repairers who may have to return their vehicle for additional work post-repair pick-up. While costly in terms of additional repair dollars, time and lost productivity, these repairs don’t also have to lead to unhappy customers.

Many collision repairers today use technology to “digitize the customer journey” through the vehicle appraisal and repair processes. This technology offers repairers’ consumers the type of experience they have come to expect — automating many of the manual steps needed to keep the customer informed throughout the repair — and it frees up the collision repairer’s time so they can focus more on the actual repair of the vehicle. With vehicle complexity growing, repairers will face further demands on their resources, making access to information and analytics mission critical to the shop. Unexpected additional work with today’s more complex repairs may be unavoidable, but anticipating them and creating a better process to accompany the customer through the process could result in better service and recommend shop scores. Including alerts or reminders for estimators and technicians based on the anticipated repair to help set customer expectations up front and throughout the repair could potentially help better manage the experience of customers who may have to return their vehicle for additional work post-repair pick-up. While costly in terms of additional repair dollars, time and lost productivity, these repairs don’t also have to lead to unhappy customers.

Figure 91 provides comparison of customer satisfaction for the vehicles returned versus not returned. Perhaps not surprisingly, the repairs that were returned had significantly fewer satisfied customers across every category surveyed, including Kept Informed and Avg Service Score. As mentioned above, these categories correlate most to whether or not the customer will recommend the shop. Unexpected additional work with today’s more complex repairs may be unavoidable, but anticipating them and creating a better process to accompany the customer through the process could result in better service and recommend shop scores. Including alerts or reminders for estimators and technicians based on the anticipated repair to help set customer expectations up front and throughout the repair could potentially help better manage the experience of customers who may have to return their vehicle for additional work post-repair pick-up. While costly in terms of additional repair dollars, time and lost productivity, these repairs don’t also have to lead to unhappy customers.

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Role of the Automaker Beyond Vehicle Purchase

Despite another year of record sales, OEMs continue to face a future of potentially fewer auto sales, and very different types of consumer expectations re: personal mobility. Many automakers have begun to transform from strictly vehicle manufacturers to companies that will facilitate all types of personal mobility in the future. As discussed above, significant investment in the “ACES” continues.

Customer retention is just as critical to an automaker and its dealers as it is to all other companies in every industry. According to Black Book and The Appraisal Lane, when factoring in all potential revenue from total lifetime gross per unit profit including F&I and referral business, the lifetime value of a customer to a dealership is more than $50,000.145 Creating an owner experience that encourages they stay within the brand with subsequent vehicle purchases is key. Unfortunately, a vehicle accident may not only be an extremely disruptive experience for the vehicle owner but may also potentially be the reason why a consumer might defect. Research has shown 50 percent of OE customers who disposed of their vehicle within 18 months of an accident did so for repair-related reasons (27 percent for damage suffered in the repair and 21 percent for quality of the repair).146

With CCC® Accident Advisor, the OE is central to making a bad experience less bad. The ability to use data from the vehicle, data on the accident itself, and known data about the vehicle owner can help facilitate an end-to-end claims experience that is digitally enabled, transparent, with fewer and smoother hand-offs among all participants. After confirmation is made that the driver and passengers are uninjured and do not need emergency services, a link is immediately texted to their smartphone, which opens a web-based application that takes drivers through important steps following an accident. Accident Advisor prompts the driver to capture facts and photos of the accident scene, offers them the option to digitally notify their insurer and to search for collision repair shops, helping to speed claims handling, reduce repair cycle time, and better manage the overall post-collision process.

<table>
<thead>
<tr>
<th>Estimate Version</th>
<th>Not Returned</th>
<th>Returned</th>
<th>Not Returned</th>
<th>Returned</th>
</tr>
</thead>
<tbody>
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<td>35.9%</td>
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<td>19.0%</td>
<td>11.8%</td>
</tr>
<tr>
<td>1st Supplement (S01)</td>
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<td>47.1%</td>
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<tr>
<td>2nd Supplement (S02)</td>
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<td>24.9%</td>
<td>24.0%</td>
<td>20.6%</td>
</tr>
<tr>
<td>3rd Supplement + (S03-S99)</td>
<td>9.3%</td>
<td>16.7%</td>
<td>12.0%</td>
<td>20.6%</td>
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</tbody>
</table>
For thousands of consumers with light vehicle damage from driveway bumps and parking lot taps, the process for getting a repair estimate can be cumbersome. It’s also wildly different than the digital experiences they enjoy in other areas of their lives. Every day, many of us use our smartphones to pre-order and pay for our morning coffee at Starbucks®, book restaurant reservations through OpenTable®, and order just about anything through mass online retailers. Think about the process for getting an estimate from a body shop. It’s a multi-step, multi-day process, including:

1. Doing research
2. Reading reviews
3. Identifying a shop
4. Waiting for the shop to open
5. Calling the shop to schedule an appointment
6. Waiting for appointment day/time
7. Driving to shop
8. Waiting for estimate to be delivered

When shops leverage photo estimating, several steps can be eliminated, and consumers get the added value of convenience — requesting and receiving estimates from anywhere, any time of day or night, while building a trusting relationship with the shop virtually.

The entire process can take hours instead of days.

**What Repair Customers Say**

Last year, CCC commissioned Magid, a consumer-centered research firm, to survey consumers about the repair experience. The results reveal that body shops should consider investing in soft skill development for the front of the shop. Magid’s mystery shopping research found that most auto shop employees are missing key opportunities to earn trust from their customers, including:

- Not calling customers by name
- Not reliably returning communication (online specifically)
- Not asking consumers if they have questions or concerns
- [Providing] little guidance regarding next steps

In order to build trust, the front office employees need to think more like service providers and less like technical experts. Customers will respond better if they are guided through the process. Staff should assume that customers do have questions, since they are out of their comfort zone in a repair facility, but they may not feel empowered to ask them. According to Magid, “providing consumers with answers to questions they didn’t even know they needed to ask will help build trust aspect and increase their confidence in the process.”

**Technology Helps to Automate Smaller Repairs**

A poor experience with the virtual interaction diminishes the likelihood of converting...
PHOTO ESTIMATES CAN BUILD TRUST VIRTUALLY

Continued

it to a scheduled repair. But a thorough, professional approach to virtual estimates can increase overall shop revenue (and build trust with the consumer). While it is possible that a shop could see an increase in the number of overall estimates being written, the total time spent with vehicle owners will be greatly reduced.

Photo estimating makes the process virtual and leaves the estimators more time to interact with live customers, guiding them through the repair process, answering questions, nurturing leads, and focusing on more complex, high-dollar repairs. Many shops take the trust-building to a new level by leveraging digital checklists to ensure that quality repairs procedures were followed throughout the repair process. Read more about Checklists in my colleague Dan Risley’s article on page 80.

Preparing Your Operations

Introducing a new technology or process requires planning to help make your shop operationally ready to leverage the capability. Photo estimating may lead to an increase in the volume of requested estimates, and processes should be structured to incorporate the new tools to reach high customer satisfaction levels.

The key is to have your standard operating procedures structured to support the generation of photo estimates in a timely and consistent manner. For example, have estimators write the photo-based estimates during known down times and reply to the customer in 24 hours (or less). Include a standard letter that answers the most common customer questions such as how to schedule a repair appointment and the shop’s hours. It’s possible that shops will have fewer low dollar appointments in the shop, but more overall low dollar estimates due to the online channel. Be prepared to handle the volume effectively. According to JD Power, “Expectation setting and clearly articulating next steps are the two most important factors in making the customer feel at ease.”¹

Photo estimating is an inevitability — consumers will come to expect the convenience and control it provides. Preparing is required for shops to embrace it and realize meaningful benefits from it. Estimating and customer interaction processes will need to be reviewed for professionalism and thoroughness. Photo-based estimates should be turned around quickly with a focus on customer service. Today’s digital consumers have high expectations, and the shop must be prepared to provide a solid, informative customer experience or face the consequences of a negative review, which they will be willing to write.

¹JD POWER, WHY CARRIERS STRUGGLE TO DIFFERENTIATE WITH DIGITAL AND END UP PAYING A PENALTY, KYLE SCHMIDTT, MAY 31, 2019.
Technology within the vehicle provides our industry with new opportunities and challenges. Vehicles involved in an accident are more difficult to repair and may often require a customer to return the vehicle after delivery for additional work. Analytics can help anticipate those and provide insurers and repairers with the needed information to set proper expectations with the customer. AI and photos can help identify whether the vehicle is likely repairable or a total loss, and if likely repairable help carriers recommend the best method of inspection for that customer based on a carrier’s criteria. Data from the vehicle itself may offer the capability to engage with the vehicle owner at the time of the loss and provide critical support and can also help inform the repair. Finding the right balance of technology and human touch on a per-customer basis helps the industry provide their customers with the best possible experience.
Cycle time and customer satisfaction are closely aligned — as repair costs and cycle time increase, customer satisfaction is lower (See Figure 92).

Growing vehicle complexity brings unexpected delays in the repair process. Understanding where and how technology can be used to remove time from the overall days between date of loss and vehicle delivered is key to free up personnel to focus on delivering a quality customer experience.
In this section of Crash Course 2020, we discuss ways in which efficiencies are found by simplifying historically complex steps within the overall vehicle claims and repair processes.

**Biding Their Time**

Over the last 15 years, repair costs for the industry have become more expensive, but roughly 56 percent of non-comprehensive losses annually fall between $1000 and $4000 (see Figure 93). These are historically the claims/repairs with the highest productivity and highest CSI. Understanding the factors behind overall cycle time for these losses can highlight opportunities present across all losses. Analysis of these losses was completed, where the losses were filtered further to include only drivable, front impact, collision losses for Q4’18-Q3’19 to arrive at a common set of claim characteristics, and to identify opportunities to simplify the claim and repair process independent of the repair itself.

The total number of days from date of loss to vehicle delivery date for this subset of losses was on average over 58 days in Q4’18-Q3’19, an improvement from 61.4 days in Q4’14-Q3’15 (see Figure 94). The entire process as we know involves multiple steps and multiple stakeholders — and while repairers and insurers have made improvements in cycle time in certain parts of the process, much of the overall time is still tied up in parts of the process in which the repairer and insurer are dependent on consumers making numerous decisions about what is, for them, an unfamiliar process.

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**Share of Annual Repairable Appraisal Volume for Losses Between $1K-$4K, CY2010-CY2019**

(FIGURE 93) | SOURCE: CCC INFORMATION SERVICES INC., CCC NATIONAL INDUSTRY

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<tbody>
<tr>
<td>$1,000.01-$2K</td>
<td>$2,000.01-$3K</td>
<td>$3,000.01-$4K</td>
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</tr>
</tbody>
</table>

**Overall Claim Cycle Time from Date of Loss to Date Vehicle Out**

(FIGURE 94) | SOURCE: CCC INFORMATION SERVICES INC., CCC NATIONAL INDUSTRY

NOTE: INCLUDES ONLY COLLISION CLAIMS WITH REPAIR COST BETWEEN $1K-$4K THAT WERE DRIVEABLE FRONT IMPACT LOSSES.
Some examples of how the overall cycle time for this subset of claims was reduced:

- The average days between date of loss and date loss reported fell from 11.7 days in Q4'14-Q3'15 to 10.1 days in Q4'18-Q3'19. As more consumers select UBI auto policies, or buy connected cars, the ability to identify the accident immediately and contact the customer is more prevalent. A comparison of claims where CCC’s telematics-enabled claim solution detected the crash versus the non-telematics enable repairable losses conducted by CCC in CY 2019 revealed significant reduction in time from date of loss to loss reported for the telematics-enabled claims. The number of days from loss to loss report was nearly 90 percent lower, for telematics-enabled claims. As connected car volumes grow, and more OEMs and insurers take advantage of this technology to drive customer engagement, this metric will likely see further reduction in the future.

- **Figure 83** provided a comparison of the time to produce the estimate during the initial estimate inspection, a key step in the process needed to help the consumer make the next decision about their vehicles. The average days from last assignment sent to estimate complete/sent was 0.6 days for those losses among the $1,000-$4,000 sample that used photo MDI versus all others at 5.1 days — a nearly 90 percent reduction.

- Previous analysis of claims data conducted by CCC revealed the overall time between when the insurance company’s customer has an estimate to when they schedule their vehicle in for repair is less for those claims where the consumer has scheduled their appointment online themselves. For consumers equipped with information about the shop and its schedule, the number of days between when the consumer receives their estimate to the date they schedule their vehicle in for repair was also nearly 11 percent lower. Access to key information on the repair shop such as proximity, DRP program participation, on-line reviews, customer referrals, or availability of OE certification all within the same platform may be helping consumers choose their repair shop quicker. And, perhaps more important, our repair experience survey revealed an easier scheduling process is a key variable driving overall customer satisfaction with the repair experience.

These are just several ways we see the industry using technology to improve and simplify the overall customer experience, where the results are meaningful reductions in cycle time and subsequently improvements in overall customer engagement. By providing digital capabilities to the consumer in key parts of an unfamiliar process in a way that provide clear easy-to-understand information, where they can use their smartphone to review that information and make decisions regarding their claim and repair, the overall cycle time industry-wide could potentially see a 12-day improvement (see **Figure 95**). As vehicle complexity increases, repair costs and repair cycle times are expected to rise further. The ability to integrate technologies into the process to help the consumer make better, more informed and faster decisions can help reduce the overall time from loss to vehicle out, potentially providing a significant counterweight to growing repair times and lift to overall customer engagement.

Part of the Solution

Historically, the process of identifying the best part, from the best supplier and delivery times, ordering those parts, matching up orders once delivered, keying in invoices, and finally paying suppliers was extremely cumbersome and time consuming. Insurance appraisers, shop estimators, and parts personnel made numerous phone calls, identifying whether catalogued inventory was available, and matching up orders and invoices upon receipt. When a part didn’t work, the part return process was even more cumbersome. Suppliers such as OEM dealers struggled with high call volumes, and ensuring their current inventory was being accessed by the largest possible audience.

With CCC® Parts, repairers are electronically connected with parts suppliers, whose live inventories, pricing and delivery times are displayed while creating the estimate. By moving parts purchase upstream to the estimating/repair planner, and to delivery availability and margin visibility, moves the point of decision upstream in the repair process. Analysis of repairers utilizing the system shows improvements in supplement rate and labor hours per repair day from improved efficiencies. Supplier preferences are automatically applied to parts quotes and orders and, once orders are confirmed, invoices flow back through the system, reducing the need to manually key invoice information. Reducing redundant non-value tasks such as manual purchase orders and invoices frees personnel up to focus on those orders that may require additional focus.

Industry analysts project online parts sales reached $12 billion in 2019, and are growing at a rate of about 12 percent annually. A survey conducted by JDJS Consulting found that dealers who use online platforms that provide real-time pricing and procurement data report a “win” rate of 55 percent on their quotes compared to 41 percent who stick with fixed prices. Finally, with...
When the Vehicle is Not Repairable, How Can Complexity in the Process Be Streamlined?

Another area where new car dealerships have seen their revenues grow is within the F&I segment of their business. As of CY 2018 dealership F&I penetration for new car sales was 89.6 percent, and 73.2 percent for used vehicle sales.155 F&I income as a percent of new vehicle sales was 2.9 percent for new-vehicle sales and 3.8 percent for used in CY 2018, up from 2.8 percent and 3.4 percent in CY 2014.156 With the average price of a new vehicle now over $35,000 — up nearly 30 percent since CY 2005 — more buyers purchase a new or used vehicle today with financing (see Figure 97). According to Experian, as of Q3 CY 2019, the U.S. had a $1.220 billion open automotive loan balance up from $968 billion in Q3 CY 2015.157 Loan balances have grown as both vehicles sold, and amount financed have grown. 31 percent of all new vehicle loans and 30 percent of used vehicle loans had a loan term of 73-84 months, up from 27.5 percent for new and 16.2 percent for used five years prior (see Figure 98).158

Experian Percentage of New and Used Vehicles with Financing by Quarter CY2010-CY2019 (FIGURE 97) | SOURCE: EXPERIAN “STATE OF AUTOMOTIVE FINANCE MARKET”

New and Used Vehicle Financing Distribution of Volume by Loan Term (FIGURE 98) | SOURCE: EXPERIAN “STATE OF THE AUTO FINANCING MARKET” Q3 2015 AND Q3 2019

Finally, companies within the aftermarket and recycler segments are looking to expand their markets via digital. According to studies on e-tailing and other trends conducted by the Auto Care Association, the e-tailing channel in 2014 was roughly $6 billion or roughly 6 percent of the replacement parts market.159 By 2017, the association’s data showed e-tailing had reached $22 billion, with a CAGR of 15 percent.160 And while that CAGR is expected to slow to 8 percent through 2020, the association anticipates the industry will continue to change — integrating online and offline shopping/purchasing experiences.154
With loan term lengths extended, more customers end up owing more for their vehicle than it’s worth. According to Edmunds, an estimated 33 percent of individuals who traded in cars to buy new ones in the first nine months of CY 2019 had negative equity, compared to 28 percent five years ago, and 19 percent a decade ago. Unfortunately, this also means that when a customer has a total loss vehicle, the likelihood that he/she still has an outstanding vehicle loan increases.

Figure 74 illustrated the growth in total loss frequency across all vehicle ages and showed how over the last five years the largest percent increase occurred among vehicles ages current year to four years of age. Many of these vehicles likely still have outstanding loan balances, given the average loan term length as of Q3 2019 per Experian was 69 months. The percent of vehicle claims that result in a total loss has risen over the last several years and is anticipated to grow further in the near future given the older vehicle fleet and higher vehicle repair costs. Given the growing share of consumers with longer loan term length, more total loss claims than ever require engagement of the lien holder, which can result in longer overall cycle time from loss to final settlement and salvage lot closed. Among confirmed total loss claims in CY 2019, the average days from the date of loss to the date salvage lot closed was 73.7 days, with only 11.6 days of those from date of loss to date of last vehicle valuation.

While heavily damaged vehicles or older model year vehicles may be more easily identifiable as likely total loss claims, an estimated 2-5 percent of claims are borderline losses, where the total loss determination is less obvious. CCC customers who enabled the suite of tools CCC® Quick Estimate -> CCC Smart Total Loss -> CCC® Quick Valuation have seen improvements in their ability to identify borderline total losses that went through the photo estimating channel. In these instances, consumers used Quick Estimate to take photos of their damaged vehicle, and when uploaded, Smart Total Loss is automatically run. Consumers are then, using Quick Valuation, prompted to confirm options and take additional photos to document things like vehicle condition and mileage. This helps process claims more quickly, and significantly faster than via a physical inspection (see Figure 99).

With increased share of claims non-repairable, the ability to more accurately and quickly identify whether a loss vehicle is a total loss earlier in the process, and to process the claim through settlement will become more important to help counter the growing dissatisfaction among insurance companies’ consumers as more owe more on their vehicle than it may be worth at time of loss.

**Total Loss Cycle Time Comparison by Inspection Method CY2019**

<table>
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<tr>
<th>Inspection Method</th>
<th>Total Industry</th>
<th>Customers using CCC’s Quick Estimate -&gt; CCC’s Smart Total Loss -&gt; CCC’s Quick Valuation</th>
<th>Photo Estimate</th>
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</thead>
<tbody>
<tr>
<td>Loss Report to Last Valuation Days Avg</td>
<td>17.3</td>
<td>12.6</td>
<td>Photo Estimate</td>
</tr>
</tbody>
</table>

Ellen Tierney

Vice President, Chief Claims Officer

MetLife Auto and Home

What is one thing you/your company spend time thinking about?

Today’s technology in vehicles — our overriding concern is the cost and repairability of newer cars. The fact that enhanced technology is now not only in high-end vehicles, but also in more affordable vehicles, brings a whole new level of complexity and cost to repairing these vehicles. As vehicle technology continues to evolve, it will challenge shops’ ability to assess and repair this technology, which will result in needing to take an entirely different approach to pricing and the claim repair process.”
...a vehicle is often the second most costly investment a consumer makes, the stakes are high when an unplanned and disruptive experience, like a vehicle accident, leaves them feeling anxious and confused.”

ADDRESSING TOTAL LOSS CLAIM PROCESS COMPLEXITY

by Heidi Ford

The total loss process exemplifies the definition of complex: “...consisting of many different and connected parts.” The numerous steps in the total loss claim life cycle (notification of loss, method of settlement, salvage, etc.) can extend across multiple participants: insurance carrier, lend, salvage yard, gap insurance provider, and others. Each participant has specific requirements, workflows, documentation, and customer touch points that can result in inefficiencies, long cycle times, and lost productivity. Many of the participants still have paper-intensive processes that are slowly being digitized. Additionally, given the number of stakeholders involved, the customer and insurance claims adjuster often have to jump between numerous touchpoints and applications, re-entering the same information many times. The process can take weeks if not months to complete and can lead to a less than optimal customer journey.

This reality runs counter to consumer expectations for how an insurance claim would be handled, which today means consumer-led and digitally enabled — the same way nearly every other transaction is managed in their daily life. And, because a vehicle is the second most costly investment a consumer makes, the stakes are high when an unplanned and disruptive experience, like a vehicle accident, leaves them feeling anxious and confused.

Total Losses on Active Loans

According to 2018 U.S. census figures, 93 percent of households reported having access to at least one vehicle.¹ Vehicle ownership is woven into the fabric of our lives but comes at a higher price. Over the last 10 years the average MSRP of a new vehicle has increased from $23,900 to $29,000, and the cost of consumer selected options increased from $6,500 to $10,000.² Over this 10-year period, vehicle prices have surged 34 percent, outpacing the mean wage increase of 4 percent.³

Consumers are paying more for their vehicles, and taking longer to pay them off — if they are able to do so at all.⁴ Edmunds reports that through the end of Q3 2019, 33 percent of consumers trading in vehicles on a new purchase had negative equity, compared with 19 percent a decade ago.⁵ On average the consumer owed $5,000 after trading in their vehicle, before taking on a new loan.

Subsequently, more consumers than ever before with a total loss claim still have an outstanding vehicle loan balance. The process of settling the total loss with the lien holder may be manual or somewhat automated but often involve other companies who have historically been very paper intensive. Acquisition of the vehicle title for title transfer also involves numerous steps, some of which are automated and support e-signature and electronic forms, but most do not.

CCC is applying its 40 years of experience to simplify, enhance the vehicle owner journey through provision of proactive digital status updates and process guidance, providing clarity and comfort during a potentially worrisome event. Powering simplification of insurance claims through adoption of digital innovations...the time is now.

1. HTTPS://WWW.VALUEPENGUIN.COM/AUTO-INSURANCE/CAR-OWNERSHIP-STATISTICS.
3. WWW.BLS.ORG.
Despite advancements in technology in vehicle design, crash worthiness, crash avoidance, millions of people in the U.S. each year are injured in motor vehicle accidents, and tens of thousands are killed.

The economic costs of providing the necessary medical care for these individuals continues to grow, as inflation in medical cost grows. In this section of Crash Course 2020 we will discuss the state of motor vehicle safety and insurance casualty claims.
Motor Vehicle Injuries and Fatalities Remain a Serious Problem

In CY 2018, 36,560 people were killed in motor vehicle traffic crashes. Early data from NHTSA for the first nine months of 2019 suggest fatalities fell further in CY 2019, with the fatality rate per 100 million vehicle miles traveled dropping to 1.10 versus 1.13 in CY 2018 and a high of 1.17 in CY 2016. While this data suggests fatalities may fall another 2.2 percent for CY 2019, after declining 2.4 percent in CY 2018 versus CY 2017, the shift in where those fatalities are occurring remains a concern. According to the U.S. Census Bureau, the urban population increased by 15 percent between CY 2008 to CY 2017, while the rural population fell by 12 percent; and the urban fatality rate per 100 million vehicles miles traveled increased by 18 percent between CY 2009 and CY 2018 while the rural fatality rate declined by 14 percent (see Figure 100). As more people move to urban areas, motor vehicle fatalities are increasing there. This shift explains in part why the composition of fatalities has shifted to more pedestrians, bicyclists and other non-occupants (see Figure 101).

Unfortunately, while fatalities fell 0.9 percent between CY 2016 and CY 2017, the National Safety Council reports medically consulted injuries resulting from motor vehicle crashes rose from 4.3 million in CY 2016 to 4.6 million in CY 2017, with an estimated cost of $433.8 billion. This figure includes wage and productivity losses, medical expenses, administrative expenses, motor-vehicle property damage, and employer costs. And while 41 percent of motor vehicle fatalities occur when the accident type was a collision between motor vehicles, 77 percent of medically consulted injuries come from collisions between motor vehicles (see Figure 102).
The good news is that more recent data from NHTSA suggests injury rates per million vehicle miles traveled may be trending down. All three measures — ‘all injury crashes,’ ‘vehicles involved in all injury crashes,’ and ‘persons injured in all crashes’ — per one hundred million mile vehicle miles traveled saw a slight decline in CY 2017 and CY 2018 (see Figure 103). Unfortunately, due to NHTSA’s replacement of the reporting system used to the Crash Report Sampling System (CRSS) in CY 2016, comparison to earlier years is not straightforward.

National Safety Council’s Risk Factors for Fatal Injuries on the Road

1) Despite laws in all 50 states for restraining infants and children in vehicles, over 1/3 of children killed in traffic crashes are not buckled up.
2) Currently, no state has a law that completely bans all electronic device use, including hands free, behind the wheel. NSC believes a full ban is the best way to prevent crashes involving distracted drivers.
3) 1 in 5 drivers on the today today are ages 75 and older, and although older drivers comprise only 7% of two-car crashes, they are more likely to be seriously injured or killed than any other age group.
4) In fatal crashes, 50% of fatalities occur among people who are unbuckled.
5) Teen drivers are 3 times as likely to be involved in a crash at night versus during the day. Just a single young passenger can increase a teen’s crash risk by 44%. Unfortunately, most states have age or driver education loopholes that permit these safety measures to be circumvented.
6) Vulnerable road users include motorcyclists, bicyclists, and pedestrians.

National Safety Council Road Safety Score

A large majority of accidents each year are caused by the driver. Driving under the influence of drugs or alcohol, driving fatigued, speeding, distracted driving, and other factors continue to play a role. According to a study from the U.S. Centers for Disease Control and Prevention, in 2018 an estimated 12 million drivers (4.7 percent) aged 16 and older drove while stoned (under the influence of marijuana), and 2.3 million said they drove after using other illicit drugs. 21 million drove drunk during the same period. IIHS has completed numerous studies revealing crash rates have risen in states that legalized retail sales for recreational use of marijuana.

The National Safety Council’s State of Safety report provides a state-by-state score of road safety, looking at key issues and factors that impact it. Nine key issues were examined, and in total were assigned an overall risk factor contribution for fatal injuries on the road (see Figure 104) (numbers do not add up to 100 percent due to overlap). Figure 105 shows the individual weighted score per state based on policy and legislation pertaining to 24 different indicators across eight safety issues: alcohol impaired driving, child passenger safety, distracted driving, older drivers, seat belt use, speeding, teen drivers, and vulnerable road users. States with a score between 70 percent-100 percent received an “A” grade; “B” = 60 percent-69 percent; “C” = 50 percent-59 percent; “D” = 40 percent-49 percent; and “F” = below 40 percent. The range in scores (a low of 11 percent for Montana to a high of 78 percent for Illinois) as well as other important demographic differences help explain why the outcome of motor vehicle accidents can be so different by state — particularly as it relates to drivers and passengers.
As more vehicles are equipped with ADAS, early data suggests we will start to see a reduction in auto crash rates, and resultant injuries and fatalities, because the vehicle speed and subsequent impact are slowed by ADAS features, even if the accident is not avoided altogether. For example, IIHS/HLDI studies of the efficacy of various ADAS features in reducing claim frequency and costs found FCW without autobrake reduced bodily injury claim frequency by 15 percent; adding AEB pushed the reduction up to 19 percent. Most of the benefits of these safety systems come to vehicle occupants. Unfortunately, tests conducted by IIHS and AAA indicate that many of the pedestrian crash prevention systems are lacking, particularly when a vehicle is taking a right-hand turn, driving at night, or driving at speeds of 30 mph. In order to promote development of better pedestrian crash prevention, IIHS has announced tougher new requirements for its 2020 Top Safety Pick and Top Safety Pick+ designations. Automakers must achieve good or acceptable ratings for the IIHS tests of pedestrian crash prevention system test, headlight evaluations, and passenger-side small overlap crash worthiness in order to achieve the designations.

Improved vehicle safety and availability of ADAS may help to reduce fatalities and injuries of vehicle occupants, but until features such as pedestrian airbags are standard and pedestrian detection systems improve, the non-occupants’ share of motor vehicle crashes may continue to trend higher.

State of the Union — U.S. Medical Costs Continue to Rise

U.S. spending on health care rose to $3.65 trillion in CY 2018, rising above $11,000 per person for the first time (see Figure 106). Growth in per capita spending increased 4 percent in CY 2018, up from 3.5 percent in CY 2017, as faster growth in medical prices more than offset slower growth in the use and intensity of health care goods and services. Higher medical prices accounted for 2.1 percent of the overall 4 percent per capita increase in CY 2018; growth in the residual use and intensity of health care goods and services accounted for 1.3 percentage points, and the changing age and sex mix of the population accounted for 0.6 percentage points. Overall, spending rose 4.6 percent in CY 2018 versus 4.2 percent in CY 2017 even as the number of Americans without health coverage rose to 30.7 million individuals, up 1 million for the second consecutive year. A slight increase in generic drugs helped drop the price of retail prescription drug prices by 1 percent — the first drop since CY 1973, but total spending on prescription drugs rose 2.5 percent to $335.17 billion.

U.S. Health Care Spending in CY2018

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<td>National Health Expenditures, in billions</td>
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<td>$2,875</td>
<td>$3,025</td>
<td>$3,199</td>
<td>$3,437</td>
<td>$3,483</td>
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<td>Annual Growth</td>
<td>4.0%</td>
<td>3.0%</td>
<td>5.2%</td>
<td>5.8%</td>
<td>4.6%</td>
<td>4.2%</td>
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<td>U.S. Census Bureau U.S. Population</td>
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<td>315.5</td>
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<tr>
<td>Annual Growth</td>
<td>0.7%</td>
<td>0.7%</td>
<td>0.7%</td>
<td>0.8%</td>
<td>0.7%</td>
<td>0.6%</td>
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<td>U.S. GDP per capita</td>
<td>$51,695</td>
<td>$53,200</td>
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<td>Annual Growth</td>
<td>3.4%</td>
<td>2.9%</td>
<td>3.7%</td>
<td>3.2%</td>
<td>1.9%</td>
<td>3.6%</td>
</tr>
<tr>
<td>NHE per capita</td>
<td>$8,908</td>
<td>$9,113</td>
<td>$9,588</td>
<td>$9,995</td>
<td>$10,037</td>
<td>$10,379</td>
</tr>
<tr>
<td>Annual Growth</td>
<td>3.3%</td>
<td>2.3%</td>
<td>4.5%</td>
<td>5.0%</td>
<td>3.8%</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

Healthcare Costs Continue to Rise Faster Than Inflation — BLS CPI Price Level Change Annual CPI Percent Change from Prior year — U.S. city average, all urban customers, not seasonally adjusted

Healthcare Costs Continue to Rise Faster Than Inflation — BLS CPI Price Level Change Annual CPI Percent Change from Prior year — U.S. city average, all urban customers, not seasonally adjusted

A comparison of the Bureau of Labor’s CPI data reveals the medical care index since CY 2001 show some of the fastest growth in the last decade occurred in CY 2016, and costs for CY 2019 are increasing faster than overall CPI (see Figure 107). The indices for hospital services, prescription drugs, and services by other medical professionals have seen larger increases over the last several years than overall inflation (see Figure 108).
If we can measure acceleration in a collision, we can more precisely determine the collision force or severity and gain better insights into auto damage and the potential for occupant injury.

Today, vehicle manufacturers offer a variety of technologies within each of these categories. For example, Automated Driver Assistance Systems (ADAS) such as Forward Collision Warning, Automatic Emergency Braking, and Blind Spot Detection are designed to prevent accidents. Occupant protection systems such as airbags, seat belts, and collapsible steering columns are designed to prevent injury when an accident occurs. Lastly, today’s telematics systems connect the car to telematics service providers who can use data from the vehicle to improve emergency medical responses to the accident scene. Virtually all of these technologies benefit from robust vehicle data capture and artificial intelligence. Interestingly, data captured for accident prevention and occupant protection technologies can be used to improve medical care to injured parties after an accident. We will explore the use of this data and how it can also benefit casualty claim processes.

Impact of Telematics Systems and Vehicle Data on Injury Outcomes

Let’s start with a review of some important background to understand why and how vehicle data is important for understanding injury outcomes. The professional disciplines of accident reconstruction and injury causation have clearly established axioms. All other factors being equal, the following are true:

1. Increasing the severity of an impact, in terms of impact force, increases the amount of damage to a vehicle, and
2. Increasing the severity of an impact, also in terms of impact force, increases the risk of injury to the vehicle’s occupants.

Please refer to the Physics Insight breakout section in this article for more information about the relationship of accident forces and accident outcomes.

If we can measure acceleration in a collision, we can more precisely determine the collision force or severity and gain better insights into auto damage and the potential for occupant injury. A few auto manufacturers now offer what is commonly referred to as Advanced Automated Collision Notification Systems (AACN) in the U.S. These systems use data from on-board sensors that measure collision accelerations to detect accidents and other on-board data elements. These data elements are transmitted via telematics and AI is used to predict the severity of injury outcomes in near real time.

Over a decade ago, the Centers for Disease Control and Prevention (CDC) published forward-looking recommendations from an expert panel on AACN and the triage of the injured patient. The expert panel found that AACN systems showed promise in improving outcomes in severely injured crash patients. Using AACN, severe, life threatening injuries can be predicted almost immediately from vehicle data using telematics and AI. Armed with these injury predictions, first responders with the appropriate level of training can be deployed to the accident scene, the location of which is also provided by the vehicle. Additionally, when severe injuries are predicted and are not easily observable by first responders (e.g., internal injuries), injured occupants should be directed to Level 1 trauma centers rather than local hospital emergency rooms. A study published in the New England Journal of Medicine showed that if someone is severely injured in an accident and they are transported to a Level 1 trauma center, their chances for survival increase by 25 percent.¹
Continued

VEHICLE DATA OFFERS THE NEXT FRONTIER...

The expert participating in the aforementioned CDC study identified a variety of vehicle-based data points that would be helpful in predicting serious injury. Two helpful data elements are not surprising: 1) acceleration, and 2) seat belt use.

Interestingly, NHTSA requires that all passenger vehicles and pick-up trucks and other lightweight vehicles manufactured on or after September 1, 2013 capture and record the following information: longitudinal acceleration data during a collision event that exceeds a 5 mph speed change in about 1/7th of a second and driver seat belt usage immediately preceding the collision. Additionally, under certain circumstances, NHTSA requires the capture of lateral acceleration data during a collision event, and front-seat passenger seat belt usage immediately preceding the collision.2

Interestingly, the capture of this type of vehicle crash data began in the early 1990’s and one of the likely purposes for the use of this data was to evaluate the performance of occupant protection systems.

The major takeaways here are: 1) auto manufacturers already have sensors and other technologies in place that capture the important data elements identified by the CDC’s expert panel to predict injury outcomes, and 2) as vehicle safety technologies become more advanced, these data elements will become more utilized and likely more accessible from the vehicle through telematics.

It should also be noted that an initial AI model designed to predict severe injury based on vehicle data was published over 20 years ago. And in 2015, an AACN system started operation in Japan. The point of these observations is that the new frontier of injury prediction from vehicle data is a more advanced capability than most appreciate.

What are the Implications to Auto Casualty Claims?

It stands to reason that if real time vehicle crash data is predictive of injury outcomes for early responders to accident scenes, it should also be predictive of the nature and extent of ensuing casualty claims.

For insurers, what are the potential benefits of a detailed understanding of expected injuries immediately after an accident when vehicle crash data is available? For starters, the following casualty claim questions can be better informed:

1. What are the likely diagnoses and treatments?
2. Will the injury claim costs likely exceed policy limits?

3. Are there any injury claims that are inconsistent with the vehicle data?
4. Is the developing treatment path consistent with the expected injury?

Armed with these insights, insurers can accurately segment casualty claims based on their complexity and straight through process the claims that experience shows will not benefit from increased human touch. The end result? Significant time savings, elimination of related process expense, and improved customer service.

Add the earlier stated benefits of improving accident scene responses and saving lives, valuable vehicle data such as acceleration and seat belt use promise to drive significant changes in the accident response and casualty claims landscape. Today’s AI initiatives at CCC aim to leverage real time vehicle crash data to inform process improvements for casualty claims. And, these improvements will be about time.

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2 NHTSA. 49 C.F.R. § 563

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Physics Insight — Breaking Down Accident Force and Its Relationship to Outcomes

As we may remember from our high school physics class, force is equal to the mass of an object times its acceleration. Physics also tells us that the mass of an object can be derived from its weight and the gravitational pull of the planet. So, in an auto collision, the weight of the vehicle, and accordingly, its mass can be easily estimated (published curb weight can be adjusted for varying fuel levels, occupants and cargo). However, acceleration in an auto collision, is the more elusive variable which must be measured or estimated to determine the impact force of any collision. Acceleration is defined as the change in velocity of an object with respect to time. Both acceleration and velocity are vector quantities which means both must be defined in terms of magnitude and direction.

Let’s examine a couple of examples of these relationships. A high speed (the magnitude), frontal (the direction) collision that causes the accident vehicle to completely stop very quickly (e.g., within 1/7th of a second — which is the time element) would be classified as a high severity (and high acceleration) frontal impact and likely cause significant auto damage and serious injuries to occupants. Conversely, a low speed frontal collision involving a vehicle of the same weight that causes the accident vehicle to completely stop over the same time frame would be described as a low severity (and low acceleration) frontal impact, causing much less auto damage and far less serious injuries, if any, to occupants.
Among the provisions of the reform law are those that enable the use of managed care networks for treating auto accident injuries; allow utilization review to ensure the level and quality of care is appropriate; provide new restrictions on attorney fees; codify the Anti-Fraud Unit; and make changes to the Assigned Claims Plan that covers accidents involving uninsured motorists. The hope is the reform will help improve the system, reduce overall costs, and reduce the average auto premium for residents of Michigan, where the average annual premium was nearly 80 percent higher than the national average.

Analysis of bodily injury claims data reveals very little change in the highest ranked diagnoses in terms of total dollars billed/claimed per diagnosis (either standalone or in combination with other diagnoses) over the last several years. Data from NHTSA continues to show rear-end collisions are the most common type of accident, accounting for nearly one-third of all motor vehicle accidents, so it is not surprising that neck injuries and treatment plans including chiropractic care continue to top the list. In fact, among third-party casualty claims referred for causation analysis, low-impact crashes (change in velocity of 10 MPH or less) as a percent of all crashes had remained relatively stable over the last several years at 72 percent but jumped to 79 percent in CY 2019.

Analysis of bodily injury claims data reveals very little change in the highest ranked diagnoses in terms of total dollars billed/claimed per diagnosis (either standalone or in combination with other diagnoses) over the last several years. Data from NHTSA continues to show rear-end collisions are the most common type of accident, accounting for nearly one-third of all motor vehicle accidents, so it is not surprising that neck injuries and treatment plans including chiropractic care continue to top the list. In fact, among third-party casualty claims referred for causation analysis, low-impact crashes (change in velocity of 10 MPH or less) as a percent of all crashes had remained relatively stable over the last several years at 72 percent but jumped to 79 percent in CY 2019 (see Figure 111). There are multiple transportation trends which may be influencing the 2019 increase in low-velocity impacts, including increasing presence of ADAS systems across U.S. vehicles and shifts in urban versus rural driving patterns.

According to the Insurance Research Council’s Countrywide Patterns in Auto Injury Insurance Claims: 2018 Edition, attorney involvement in auto injury claims also continues to climb (see Figure 112). Insurance Research Council research has shown claims with attorney involvement tend to have higher utilization rates for chiropractic treatment, physical therapy and expensive diagnostic

Historically, most of the trends in PIP were driven by three of the largest states with no-fault approaches to compensating auto injuries — Florida, Michigan, and New York. Michigan finally passed a major no-fault reform law in 2019 that goes into effect July 1, 2020. For the first time in nearly 50 years, residents of Michigan will no longer be required to purchase unlimited, lifetime personal injury protection.
Medical inflation is in large part being driven by a number of key variables.

To understand some of the key factors driving the above trends in auto BI and PIP claim frequency and loss costs, Auto Injury Solutions, Inc. (AIS), a CCC company, completed an analysis of over 4 million auto BI and PIP/Medpay claims processed through CCC’s casualty products for the period CY 2015-CY 2019. The results of this analysis are outlined below.

**Bodily-Injury Claims Review**

For the period of study (CY 2015 to CY 2019), the top diagnoses for bodily injury claims in terms of overall dollars charged have remained consistent, with neck pain (Cervicalgia) and neck sprain and strain among the top one or two positions in the last four years (see Figure 113).

Subsequently, there were only moderate changes in both the procedure utilization by category (see Figure 114), and the medical procedures billed for treatment of bodily injury claims (see Figure 115), underscoring the consistency in the types of injuries, diagnoses, and treatment over that period. Worth noting is a comparison of the top diagnoses based on dollars billed versus the top procedures based on dollars billed underscore the fact that the highest frequency diagnoses are not directly related to the highest cost procedures. In other words, the majority of injuries from high frequency lower speed accidents involve treatments with lower overall costs, while lower frequency high-speed accidents involve treatments with higher overall costs. A noteworthy change in ranking procedures based on dollars-billed is the increase in the ranking for emergency department visits and the appearance of “CT head/brain w/o contrast material” among the top 10 procedures billed in the last five years. There is some debate that greater public awareness of traumatic brain injuries among athletes who have sustained numerous concussive head injuries has led to more individuals injured in vehicle crashes concerned about similar injuries, subsequently leading to more claims with related medical procedures. According to data from the Centers for Disease Control and Prevention, TBI-related emergency visits, hospitalizations and deaths increased 53 percent between CY 2007 and CY 2014.

Growing use of ‘lien-doctors’ (typically referred to injured by plaintiffs’ attorneys) that agree to provide medical treatment for the injured and get paid after the litigation is resolved is also believed to be a factor driving up litigation costs overall as well. In fact, there is growing belief that increases in casualty claims severity exceeding the CPI medical inflation rate can be attributed to increasing attorney representation fees.

Low Impact (change in velocity of 10 MPH or less) as a Percent of All Crashes for Third Party Casualty Claims Referred for Causation Analysis, CY2012- CY2019

**Attorney Involvement in Auto Injury Claims**

<table>
<thead>
<tr>
<th></th>
<th>CY2017</th>
<th>CY2012</th>
<th>CY2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIP Claims</td>
<td>52%</td>
<td>50%</td>
<td>49%</td>
</tr>
<tr>
<td>BI Claims</td>
<td>59%</td>
<td>36%</td>
<td>32%</td>
</tr>
</tbody>
</table>

For details on low impact crashes and attorney involvement in auto injury claims, refer to the respective figures (Figure 111 and Figure 112) provided by CCC Information Services Inc., AIS.
BI Claims: Top Medical Treatment Procedures Ranked Based on Total Dollars Billed for Period CY2015–CY2019

(FIGURE 115) | SOURCE: AUTO INJURY SOLUTIONS (AIS), A CCC COMPANY

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapeutic pc 1/&gt; areas each 15 min exercise</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Operating room/other</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Emergency department visit high/urgent severity</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ct cervical spine w/o contrast material</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Mri spinal canal cervical w/o contrast material</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Mri spinal canal lumbar w/o contrast material</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Manual therapy top 1/&gt; regions each 15 min</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Chiropractic manipulative tx spinal 3-4 regions</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Ct head/brain w/o contrast material</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Ct abdomen &amp; pelvis w/contrast material</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Medicine &amp; Rehabilitation Procedures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiology Services Procedures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilities Procedures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BI Claims: Top Diagnoses Ranking Based on Total Dollars Billed for Period CY2015–CY2019

(FIGURE 116) | SOURCE: AUTO INJURY SOLUTIONS (AIS), A CCC COMPANY

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervicalgia</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Low back pain</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sprain lig cerv spine initial enc</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Strn musc fasc tendon neck lev int</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sprain ligaments t-spine initial</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Radiculopathy cervical region</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain in thoracic spine</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Radiculopathy lumbar region</td>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Procedures in Third Party Auto Casualty CY2015–CY2019 All Closed Claims

(FIGURE 114) | SOURCE: AUTO INJURY SOLUTIONS (AIS), A CCC COMPANY

NOTE: RADIOLOGY PROCEDURES INCLUDE CTS, MRIS AND OTHER DIAGNOSTIC XRAY STUDIES.

Overall, however, when reviewing summary level procedure data, we see just how little change there has been over the last five years in ranking of the most common procedures based total amount paid (see Figure 116), with steady growth in average fees per procedure for many of the most common (see Figure 117).
So why are third-party medical costs increasing? The newer drivers of rising cost are twofold: 
a) the same types of injuries are being treated with more expensive treatment approaches (e.g., emergency room and hospital related treatments); and b) cost-increases in these more expensive care modalities are increasing at a much faster rate than traditional modalities such as chiropractic and physical therapy related procedures.

**PIP/Medpay Claims Review**

PIP/Medpay claims analyzed from CY 2015 to CY 2019 reveal very little change in the diagnoses of injuries: neck pain (Cervicalgia) or neck sprain and strain held the top spots in four out of the last five years, while low back pain or lumbar sprain and strain was typically in second place (see Figure 118). Medical procedures for PIP/Medpay claims — both in terms of frequency (see Figure 119) and when ranked in terms of dollars billed (see Figure 120) — saw greater use of emergency room and neurology procedures.

**PIP/Medpay Claims: Highest Ranked Diagnoses in Terms of Dollars Billed/Claimed for Period CY2015-CY2019**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervicalgia</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Sprain lq cerv spine initial enc</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Strn musc fasc tendon neck levl int</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Low back pain</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Radiculopathy cervical region</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neck sprain and strain</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Car occ inj head head initial enc</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiculopathy lumbar region</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oth lq disc displacement lumbar rgn</td>
<td>9</td>
<td>9</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ct abdomen &amp; pelvis w/contrast material</td>
<td>10</td>
<td>10</td>
<td></td>
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</tbody>
</table>

What has seen significant change is the average number of days between the first treatment date of service to the last treatment date of service, which grew from 140 days in CY 2015 to 211 days in CY 2019, while the median number of days grew from 85 days to 91 days over the same period.

Historically, increases in utilization were a principal cause for the rising costs in medical dollars for BI claims. However, for the observation period from CY 2015 to CY 2019, the number of unique procedures has essentially been flat (21 across all five years), as has the average number of procedures: 175 in CY 2015, 172 in CY 2016, 168 in CY 2017, 172 in CY 2018 and 174 in CY 2019.
This also underscores a trend to monitor — ADAS may be helping reduce the frequency of low speed crashes with less severe injuries, leaving carriers with more crashes with higher velocity collisions where injuries are more severe. Additionally, rising costs are coming with more costly procedures, higher costs per procedure and rising number of visits. Figure 121 shows how the average number of unique procedures for first-party claims was unchanged at 10 procedures throughout the period analyzed, but the average number of procedures grew from 98 to 119 between CY 2015 and CY 2019.

Finally, a comparison of the average charge-per-claim and the average charge-per-claim excluding duplicates reveals the increase in medical inflation, where the same types of treatments and procedures are simply being billed at higher rates (see Figure 122).

First Party Casualty — Average Total Number of Procedures Increasing While Average Number of Unique Procedures Remains Flat All Closed Claims CY2015-CY2019

First Party Casualty — Average Total Number of Procedures Increasing While Average Number of Unique Procedures Remains Flat All Closed Claims CY2015-CY2019

Notes: Figure 121 shows how the average number of unique procedures for first-party claims was unchanged at 10 procedures throughout the period analyzed, but the average number of procedures grew from 98 to 119 between CY 2015 and CY 2019.

Figure 122 shows the increase in medical inflation, where the same types of treatments and procedures are simply being billed at higher rates.
After a car accident, we might find ourselves in an emergency department, dressed in an exam gown and covered by a thin blanket on a hospital gurney. In that moment we have no way to speed through a doctor’s evaluation, diagnostic testing, or clinical treatment. There’s no steering wheel to grab on to, and no motor on the bed. What comes to mind? Maybe it’s a thought, like “Where’s my car?” Or, possibly, “Am I going to make it to work tomorrow?”

As the experience drags on, clinicians eventually explain their findings and recommendations. A nurse comes with paperwork. Finally, return home is near. In the days to follow, an auto repair facility will address vehicle damage. But it may take weeks to feel better — physically and mentally — or not. Perhaps an outpatient chiropractic visit will become necessary, or a physical therapy treatment will be needed. What is certain is that soon medical bills will arrive soon.

Casualty claims management makes a difference for consumers in the increasingly complex healthcare environment. Through the combination of clinical expertise and technology, auto casualty solutions optimize the digital processing of medical bills causally related to motor vehicle collisions. While every accident is unique for the people, time, place and circumstances involved, accumulating data-driven insights show how macro-trends impact auto injury claims severity and challenge auto insurers.

Jurisdictional Trends

State jurisdictions differ in auto personal injury protection insurance regulations; however, recent data reveals less-apparent state-based influences on auto casualty claims risk. Regulations on speed limits, marijuana legalization, alcohol-related driving law enforcement, and the opioid epidemic vary significantly across the U.S., reshaping patterns of auto casualty claim severity.

Road Speed Limits

Over the last decade road speed limits have increased in many localities, including the states of Wisconsin, Illinois and Indiana. Across the U.S., the National Highway Transportation Safety Administration documented fewer single and multivehicle collisions occurring at less than 30 mph in police-reported crashes, with about 76 percent of all these crashes happening at 30 mph or greater. More than 86 percent of injury crashes were reported at 30 mph or greater.

As Scott Palmer notes in this publication, there is a known relationship between change in velocity, or Delta V, at collision impact and injury potential. Consequently, higher speed collisions can result in more trauma, surgeries, and complications, as well as longer rehabilitation periods, thereby increasing casualty claims severity.

Marijuana Legalization

Impaired driving risk is non-uniform across the U.S. For example, states have varied in their actions on marijuana legalization. As of early 2019, Alaska, Washington, Oregon, California, Nevada, Colorado, Michigan, Vermont, Massachusetts and Maine had legalized consumer recreational and medical marijuana use, while 22 other states had authorized prescribed medical marijuana. In its 2019 report, the U.S. Congressional Research Services summarized the U.S. National Academy of Sciences’ significant finding of statistical association between marijuana use and increased risk of motor vehicle accidents.

Alcohol-Associated Impaired Driving

Differences in state alcohol-associated impaired driving patterns have been noteworthy as well. As reported by the Department of Transportation’s National Center for Statistics and Analysis based on 2017 data, Texas, Wyoming and Montana had 35 percent or more alcohol-impaired driving

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TRENDS IMPACTING AUTO INJURY CLAIMS...

Continued

fatalities, while Rhode Island’s experience was at 41 percent, Connecticut at 43 percent and Washington D.C. at 51 percent.

Alcohol-impaired driving fatalities are an indicator of the prevalence of driving under the influence in the state of record, as coroner involvement and death certificate data are rigorously addressed. These fatalities have been understood as the “tip of the iceberg” when it comes to the scale of each state’s challenge to combat drunken driving behaviors.

Opioid Associated Driving Fatalities

Impaired driving attributable to use of opioids also intensified across the last decade. For the U.S., the percentage of fatally injured drivers who tested positive for prescription opioids rose seven-fold from 1 percent in 1995 to over 7 percent in 2015. According to the U.S. Centers for Disease Control and Prevention, between 2016 and 2017, Oregon, Arizona, Minnesota, and North Carolina experienced significantly increased numbers of opioid deaths, signaling epidemic crises in those areas.

While public awareness has increased about the opioid use prevalence in every neighborhood and socioeconomic group, law enforcement and healthcare providers continue to struggle to meet the escalating epidemic’s fallout. There is little documented indication that the opioid epidemic has abated, suggesting continued driving risk associated with prescribed and illicit opioid use.

Aging Populations

A second macro trend shifting U.S. auto casualty claims severity is seen with the growth of aging U.S. populations. A key data insight is that the generational transition with the maturing of “Baby Boomers” has not been distributed evenly across all states. Between 2007 and 2016, the number of people aged 65 years or older in the United States increased by 30 percent (males by 35 percent and females by 26 percent), with the total population across all age groups increased by 7 percent. States most recently affected by this demographic shift include Texas, California, Florida, Georgia, North Carolina, Washington and Arizona.

As generational aging has impacted state populations, the distribution of licensed drivers has trended older as well. For example, of Michigan’s 2017 population, 72.3 percent were reported as licensed drivers. In 2017, one out of five Michigan licensed drivers (20.5 percent) was aged 65 years or older. Of these, 3.4 percent were accountable for 50,807 of Michigan’s total number of 314,921 crashes in 2017, suggesting a highly disproportionate risk of collision for senior drivers.

Substantiating the recognition of age-related driving risk for seniors, a published 2017 national report of age-related differences in fatal intersection crashes shows teens and drivers aged 55 years and older were “over-involved” in fatal intersection crashes, while drivers aged 20 to 54 years were “under-involved.” Remarkably, the study showed that the fatal intersection driving risk across all driver age groups was doubled by age 85.

Treatment Complexity

The third major trend related to auto casualty claims severity is greater treatment complexity. Treatment complexity in auto casualty reflects broader healthcare initiatives related to evidence-based medicine (EBM) guidelines, diagnostic intensity, and aging-related care considerations.

• EBM guidelines, protocols, and recommended practices influence clinical evaluation, treatment and rehabilitation nationally, by jurisdictional and on a specialty basis. As electronic medical record systems penetrate large health system operations, EBM’s incorporation into patient evaluation protocols, prescribing systems, diagnostic testing algorithms and care paths is more routine. For example, the consistent and expanded use of diagnostic imaging with suspected head injury or blunt abdominal trauma (BAT) has been in part due to generally accepted EBM guidelines.

• Attention to diagnoses commonly associated with motor vehicle accidents has increased. For example, heightened monitoring of traumatic brain injury diagnoses has evolved in many states in tandem with state emergency medical systems (EMS) and state trauma registries. As a result, there is wider awareness the association between motor vehicle accidents and the occurrence of clinical conditions such as headaches, concussion, and traumatic brain injury or TBI. First responders and emergency clinical providers are trained to evaluate for these conditions in auto accidents, just as today team coaches are expected to manage player risk of concussion in sports situations across all age groups.

• Age-related treatment complexity, for pediatric and senior populations, is now widely recognized. In this regard, the American College of Surgeons and the Pediatric Trauma Society’s guidelines have been influential, as these are the basis for EMS protocols in most states. Clinically relevant concerns include medical frailty, eligibility for certain types of care, or difficulty with post-injury rehabilitation protocols. Regarding seniors, data show that in injury treatment scenarios, older patients are likely to have more than one pre-existing medical condition, take multiple medications, and be at risk for complications even with simple procedures.

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Summary

Jurisdictional differences, aging populations and increasing treatment complexity are impacting auto casualty risk and claims management. These trends are likely to continue into 2020 and beyond. The good news is that technology solutions can assist carriers in managing locational, generational and healthcare-related changes in auto casualty claims severity.

Moreover, by aligning deep medical insights about how auto crashes might result in injuries, along with state-specific automated processing of healthcare transactions, medical bill payments can be addressed more efficiently. Efficiency gains rely on the use of artificial intelligence, machine learning, and data analytics to advance digital claims management.

These three key innovations link the sciences of engineering and medicine. As a result, the time-in-process for resolving the reimbursed relationships in an auto casualty claim between providers, healthcare facilities, and allied health resources can be reduced. Furthermore, the consumer can benefit from the knowledge that their insurer is addressing their claim with expert processing relying on the facts and details personal to their accident.

How do you/your company spend your time?

We continue to focus on our future through the lens of an ecosystem, which revolves around our customers and employees. The digital realities of artificial intelligence, machine learning, robotic processing, telematics and digital process mapping are all escalating the rate of change. This has also increased the possibilities of connectivity and new joint ventures within the industry. As a company, we’re continually evaluating how we evolve the skills of our employees so they can more easily embrace the changing environment; the industry collaborators we work with to help create the change, and ability for all of it to be seamless for the customer.”
The types of auto-related BI and PIP/Medpay diagnoses most frequently seen in the last three years have remained relatively unchanged and are predominately by nature soft tissue neck and back injuries. Despite the prevalence of improved head restraint systems, seat backs and other related occupant safety features, treatment has become more complex and the overall cost of treating these same injuries has increased.

At the same time, the average age of the claimant continues to increase in both BI and PIP claims. According to Pew Research, 29 percent of Baby Boomers aged 65-72 years older were still employed or looking for work in CY 2018, a higher share than for the Silent Generation or Greatest Generation when they were the same age.185 With employment high among an age group traditionally retired, it also means more individuals are on the roads during peak commuting hours. Data from the 2014-2018 American Community Survey (ACS) shows labor force participation rates among those ages 65 to 74 years increased to 25.7 percent from 25.2 percent in the 2009-2013 ACS and increased from 5.9 percent to 6.6 percent for those ages 75 years and older.186 Continued increases in this metric over the longer-term point to higher medical costs per patient as the treatment of older patients, all things considered equal, can become more complex and thus more costly relative to their younger counterparts. With advanced age, individuals may appear during crash triage with inter-current health conditions, more use of medications, and physical or psycho-social vulnerabilities in the setting of acute trauma, thereby

Despite the prevalence of improved head restraint systems, seat backs and other related occupant safety features, treatment has become more complex and the overall cost of treating these same injuries has increased.
complicating their initial clinical evaluation and management (E&M) and requiring more initial medical, surgical or diagnostic procedures. According to the U.S. Census Bureau projections, by CY 2030, all Baby Boomers will be older than age 65 — meaning one in every five residents in the U.S. will be of retirement age.187

Recent data from Gallup’s annual Health and Healthcare survey reveals 43 percent of U.S. households have at least one member in the family with a “long-term medical condition, illness or disease that would be considered a ‘preexisting’ condition by a health insurance company,” down slightly from 46 percent from the survey one year prior.188 Preexisting conditions among adults aged 65 and older and aged 50-64 report are reported at a rate twice as high as the rate reported by young adults aged 18-29 (see Figure 123).189

Americans’ Reports of Preexisting Medical Conditions in Their Household, 2018-2019

(FIGURE 123) SOURCE: MCCARTHY, JUSTIN. “43% OF U.S. HOUSEHOLDS REPORT PREEXISTING CONDITIONS.” WWW.GALLUP.COM, DECEMBER 6, 2019.

Do you, personally, or does any other member of your family living with you, have a long-term medical condition, illness or disease that would be considered a "pre-existing condition" by a health insurance company?

- Respondent or family member
- Respondent personally

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Respondent or Family Member</th>
<th>Respondent Personally</th>
</tr>
</thead>
<tbody>
<tr>
<td>65+ years old</td>
<td>50%</td>
<td>33%</td>
</tr>
<tr>
<td>50-64 years old</td>
<td></td>
<td>49%</td>
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<tr>
<td>30-49 years old</td>
<td></td>
<td>40%</td>
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<tr>
<td>18-29 years old</td>
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<td>38%</td>
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Additionally, many of the top BI and PIP/Medpay treatment procedures have ranges to be considered when being billed. These ranges include the level of service selected or the number of units that are employed. The percentage of claims that include these types of medical services has grown; in fact, the Insurance Research Council recently published research that showed medical utilization rates exceeding national norms were a primary contributor to high claim costs in eight of the 12 least affordable auto insurance systems.190 Other factors included: High injury claim frequency rates, excessive attorney involvement, and high rates of claim abuse.

As more people move to high-deductible insurance plans or plans with co-insurance provisions that mean higher out-of-pocket expenses, the temptation to find a way to have that covered elsewhere grows.191 Results of a survey conducted by the Kaiser Family Foundation and the L.A. Times reveal annual deductibles in employer-based health plans nearly quadrupled in the last decade, averaging about $1300.192 Yet, more than 40 percent of workers in the high-deductible plans lacked the savings to cover such an expense, choosing instead to cut back on household spending, delaying or skipping needed medical care.193 And the growing number of people who work within the gig economy means fewer covered under group health insurance plans.

Since CY 2016, numerous efforts by the Republican-controlled U.S. government to repeal the ACA have resulted in several changes that weaken the bill. Among these changes were the following. In December 2017, Congress reduced the individual mandate penalty to $0 effective in 2019.194 In 2018, new rules were announced that allow more loosely regulated plans. Additional changes expanded the use of health reimbursement arrangements (HRAs) which let employers use tax-exempt funds to help workers pay for medical plans in entirety, essentially subsidizing workers buying entire health plans on the individual market instead of offering a group plan.195 These changes may enable healthy people to find lower cost coverage, but that coverage may be less comprehensive, and can exclude some pre-existing conditions.196 Finally, in mid-December 2019, Congress passed a repeal of three taxes meant to help pay for the Affordable Care Act, and the 5th U.S. Circuit Court of Appeals ruled that the individual mandate is unconstitutional and unlawful under federal taxation rules. While this ruling weakens the bill, California is appealing the case to the Supreme Court.197

A January CY 2019 report by the Kaiser Family Foundation reported the number of uninsured in the U.S. rose in 2017 for the first time since the implementation of the ACA to 10.2 percent of the nonelderly population (see Figure 124).198 As a result, there are higher numbers of uninsured Americans, which will add to the pressure to reduce healthcare expense, particularly by Medicaid.199 Subsequently, with less money available in the system, the P/C insurance industry might become an even bigger target of cost-shifting in the future.
Finally, growth of ADAS-equipped vehicles within the registered vehicle population is expected to reduce auto injury frequency and severity based on analysis from IIHS/HLDI and others. Research conducted in our Crash Course 2019 revealed the Delta-V, or severity of a crash, may be less for ADAS equipped vehicles involved in a crash. The Delta-V (or speed loss or gained in a crash) as well as the speed of the vehicle prior to the crash and the direction the impact came from, are important in determining the mechanics and severity of the injury. If ADAS is in fact helping to avoid more low speed crashes where injury severity is higher. Other variables such as the age of the driver, as well as driver’s understanding of ADAS true capabilities (i.e. mode confusion, role confusion, and misplaced trust) may mean ADAS could have very different benefits/outcomes depending on the demographics of the driver. So, despite all the potential benefits to BI and PIP frequency and severity expected from ADAS, people are still involved, so it becomes ever more critical to focus on the experience that is distinct to each individual, and to understand the implications of those differences to your business.
TIME TO PREPARE
EMBRACING THE NEXT WAVE OF TECH

Until now, the utilization of mobile, AI, and IoT were part of the strategy for pioneers and leaders within our industry.

So, what is next? As we look to 2020 and beyond, it’s important to remember that while we cannot predict the future, we can prepare for it. In this final section of Crash Course 2020, we look at some of the biggest challenges facing the industry, and what opportunities technology of today and the future may offer.
Moving forward, those same technologies will play a transformative role and will become building blocks to the other technologies such as autonomous vehicles, voice technology, IoT hardware, 5G connectivity, intelligent automation, industrial software, robotics, semiconductors, extended reality, and quantum computing.204

We have moved into the post-digital world — which Accenture writes now means that “… digital technologies are now so integrated into people’s lives that they have become part of consumers’ identities … technology identities are part of an emerging feedback loop … resulting [in] ‘snapshots’ of insight into customer needs and goals to deliver personalized products and services … [and now] individualized experiences.”205

Transformation of Risk Management

The insurance of tomorrow will continue to pay claims but may provide more technology to avoid claims altogether. Already carriers offer customers IoT and sensor technologies to do things like monitor leakage from washing machines and hot water heaters, smart fire detectors that alert emergency services, and health and fitness trackers. As the digital ecosystem becomes more intelligent and understands more about each person’s background, preferences, interests, and intentions, digital experiences will become ever more personalized.

While continuing to be a payer, the insurer of the future will take a holistic approach to customer risk management by evolving to become both a partner and a preventer.”

SOURCE: CAPGEMINI AND EFMA. 2019 WORLD INSURANCE REPORT.

IoT Devices Outnumber Human Brains

(FIGURE 125) SOURCE: THE ECONOMIST, UNITED NATIONS (AUTONOMOUS RESEARCH REPORT, APRIL 2018).

In the future, technology such as location detection, smart sensors and augmented reality will do more than simply collect and deliver information. In CY 2017, researchers used Google Street View images to study the distribution of car types in the U.S. and then used that data to determine the demographic makeup of the country — including things like income level, education, occupation, and even the way you vote in elections.208 More recently, researchers at Stanford and the University of Warsaw in Poland used Street View images of people’s houses to determine how likely they are to be involved in a car accident. Their research found that features visible on a picture of a house were predictive of car accident risk, independent of variables such as driver age or zip code.207 While numerous issues would need to be resolved, the wealth of data available to potentially collect, analyze and utilize will continue to grow rapidly in the future.
Climate Change is Costly

The University of Cambridge Centre for Risk Studies' Global Risk Index predicts as much as $584 billion, or 1.55 percent of 2020 global GDP could be erased from the global economy by catastrophic events in 2020 — an increase of 3 percent from the prior year.210 Key to how the world manages its exposure and its recovery are insurance, reinsurance, and insurance-linked securities (ILS) capital.211 Allianz SE estimates fighting climate change will cost companies worldwide nearly $2.5 trillion over the next ten years.212

Significant storms and catastrophic events continued to batter the U.S. in CY 2019. In early July, the meteorological phenomenon ‘Ring of Fire’ hit numerous parts of the Plains, Midwest and Northeast. Several days after baseball-sized hail hit Denver and Fort Collins, as well as other part of WY, NE and SD. In total, these storms as well as others in July alone led to an estimated $2 billion in damage.213 In total, the U.S. experienced three billion-dollar events related to convective storms — economic losses for the first half of the year in the U.S. was 14 percent above the 21st century average.214 Hurricane Dorian slammed into the Bahamas in early September as a Category 5 hurricane with 185 mph winds — one of the strongest cyclones ever recorded in the Atlantic Ocean.215 Also in September, Tropical Storm Imelda dumped more than 40 inches of rain in areas east of Houston into Louisiana, resulting in over 10,000 vehicle flood claims.216 As of late October, CY 2019, California wildfires had caused $25 billion of damage to properties.217 On a single day — October 20, 2019 — nine tornadoes were confirmed to have touched down around Dallas county resulting in losses of around $2 billion — the costliest tornado outbreak in Texas history.218

Changes to the environment bring significant challenges to all — the ability to underwrite the risk, cover the losses, and reduce the exposure from business interruption and property loss will require transformation of traditional insurance models. There is some hope that technology can help address some of these risks. For example, there are several companies (Descartes Labs, Planet Labs, and Jupiter Intelligence) that use data from satellite imagery and sensors, integrate with other data on the weather, terrain, vegetation, humidity, wind, etc. to provide real-time data to firefighters and even model potential dangers from one hour to 50 years out.219

As the number and magnitude of risks grow, insurers’ success is dependent on the ability to use data and technology to deeply understand the risks, to help mitigate losses, to expand coverage and offer extreme personalization. As vehicle, personal tracking devices, and home technologies develop, the ability to use the data collected and data available from numerous other sources will be central to risk management.
Level 5 — How Far Off?

As we discussed at the start of this publication, automakers and other technology companies continue to make huge investments in the “ACES” — autonomy, connected car, electrification, and shared vehicles.

The testing and development of technologies to support a fully autonomous vehicle for personal use, last-mile delivery, and numerous other scenarios continues to ramp up, despite timelines for mass-market delivery pushed out by at least a decade. In 2020, Waymo will expand its pilots of autonomous vehicles across numerous cities, and expand its testing of Waymo One, its commercial driverless taxi fleet. In China, Baidu’s Apollo Robotaxi goes live with its fleet of robo-taxis operating at Level 4 autonomy in Changsha, Hunan province and in North China’s Hebei province. As China looks to become a global leader in autonomous and connected car technology, it has ramped up autonomous vehicle trials on dedicated roads and test centers.

In 2019, global private AI investment was over $70 billion, with investment in AI startups growing from $1.3 billion in CY 2010 to over $40.4 billion in 2018. The Artificial Intelligence Index Report 2019 showed the largest share of global investment in 2019 went to Autonomous Vehicles ($7.7 billion or 9.9 percent of the total), followed by Drug, Cancer and Therapy ($4.7 billion, 6.1 percent), Facial Recognition ($4.7 billion, 6.0 percent), Video Content ($3.6 billion, 4.5 percent) and Fraud Detection and Finance ($3.1 billion, 3.9 percent).

The autonomous vehicle of the future will be a platform integrating numerous types of technology and software from numerous providers. With people increasingly removed from the task of driving, the variables used to determine risk and appropriate coverage will change dramatically. Access to the information generated by the vehicle, by infrastructure, by other vehicles, and more will be critical to inform risk and liability. Who has access to that information may also change who is underwriting that risk in the future.

As automakers, technology companies, insurers and others look to the future of transportation, anticipating which technologies will be most impactful is perhaps the biggest challenge. Creating an environment where new technology can be understood, studied, and tested for various applications will be central to an organization’s readiness for the future.

What do you think the biggest evolution in the industry will be?

Bob Cretel
Claims Group Manager
Auto Club of California

Having spent almost four decades in the personal lines insurance industry, I’ve had the benefit of seeing many changes during my career. Artificial Intelligence (AI) adapted for insurance claims will be the biggest evolutionary change, perhaps even revolutionary change, in our industry. Much of the claims resolution process involves a consistent process of gathering key bits of data to determine coverage, liability and damages. Artificial Intelligence tools have shown to be easily adapted to assist with the process. I do not know how it works, but I know how it helps. From completing rudimentary tasks to damage assessment to automatic payments, AI is streamlining the claims process as never before. Artificial Intelligence applied to facts, damages, and GPS quadrants have shown to be able to replicate real events removing some of the guess work of claim resolution.

How insurance carriers adapt to AI will determine their ability to compete in the coming years both in service and financially. The key will be for AI to augment the claims professional’s skills rather than replace the claims professional. We have become a very connected society. Gathering, filtering and effectively using all this data for the benefit of consumers will require confidence and a little blind faith.”
The computer and communication industry is facing the largest technology inflection point seen in the last 30 years. Technological advances like artificial intelligence (AI), advances in mobile computing, Natural Language Processing/Understanding (NLP), Internet of Things (IoT), and cloud computing are greatly influencing and driving change within every sector, including the industries served by CCC and our customers.

In order to proactively address and embrace these and other advanced and enabling technologies, CCC has been hard at work in our own research and solutions incubation facility. The main driver for such an initiative? There are several:

1. We are passionate and committed to technological advancement as a way to deliver services to our customers that benefit from these new technologies. To be successful, we must understand and explore numerous hypotheses related to the embodiment of these technologies into our products and services.

2. It is essential that we work closely with customers as we navigate together this maze of new technologies. To do so, we need dedicated facilities (our lab), resources, and processes.

3. To evolve and deliver the best of the best solutions and services, we need to be agile, proactive, and focused on the core business and evolving peripheral markets.

4. We must invest in our most valuable assets — our people, who need to continue to evolve their knowledge of technology and the market.

Key Fundamental Pillars of Innovation at CCC

The success of any innovation facility is measured ultimately by one major factor: How quickly and successfully have we delivered operational solutions to our customers that substantially improve their service and operations? Focused on success and value delivery, we’ve organized around five core pillars:

- Talent: we have staffed the operation with highly technical people with diverse technical foundations. Over 90 percent of our technical staff have advanced degrees (Master and Ph.D.) in a variety of disciplines such as computer vision, computer science, operation research, mathematics, statistics, and quantum physics. This enables our innovators to analyze problems from many different perspectives.

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Continued

AN INCUBATION FACILITY WITHIN CCC: WHY?

What have we accomplished so far?

In the three years since opening the doors to the CCC Innovation Foundry we have produced and introduced significant solutions and industry advancements, of which we are extremely proud, including:

• Continuous experimentation: At any given time, our staff is conducting dozens of parallel experiments. These experiments are designed with defined scope and timelines. The results are either followed into a full developed product or valued for their contributions as learning opportunities.

• Data: We have developed a data analytics and science platform to host and enable transformation of data in potentially new ways.

• Tight coupling with the core business: The innovation foundry operates within the financial and operational framework that governs the core and growth businesses of CCC, making the activities of the innovation foundry are planned and correlated.

• Direct customer involvement: Customer feedback in the innovation process has resulted in an extremely practical and purposeful environment. The foundry often has several experiments and research being conducted by a CCC team soliciting feedback from customers.

• Mobile Platform-based APD Claim Processing: The end-to-end digital claim processing starts with the smart mobile device. We have developed and delivered a consumer-led experience capturing damage related images via a mobile phone. The ingested data feeds the insurance appraisers’ mobile platform work area for assessing the damage. This has dramatically increased accuracy and efficiency of estimation and overall claim processing.

• Incorporation of Artificial Intelligence in CCC’s Estimating Platform and Workflow: We have developed hundreds of AI models for integration within the customer’s workflows. For example, we have developed an ensemble of models that can detect with high level of accuracy the likely damaged parts from a few photo images. The system also recommends replacement or repair of the damage parts based on the inputs provided. This technology has been integrated with CCC’s estimating platform. Other examples of use of these models include a predicted range of total cost of repair from photos, or given an estimate of the repair, models flag estimates that need to be re-examined. We have also developed models to examine the quality of the input images from a damaged car and detecting the angle from which the image was taken; for example, left-front, right-front, left-rear, etc.

• Telematics based Accident Detection: From the signals received from the car, via intelligent analysis we can detect occurrences of several events including an accident. This capability enables a series of potential proactive services including informing emergency services and insurance company engagement.

Ahead in 2020

The solutions delivered from our work in the Innovation Foundry have been vetted in 2019 and have demonstrated substantial gains towards smart, digital, and efficient claim processing. More than 60 insurance customers have embraced our mobile platform and we’re moving toward a similar tipping point with AI-powered solutions, achieving a level of maturity that supports streamlined incorporation into the workflow and delivering immediate benefits.

In 2020, CCC’s Innovation Foundry will continue to deliver on its promise and charter. The activities will continue to support digital APD and claim processing. Our mobile platform will continue to evolve both from a computational perspective and as a platform for information ingestion. Our research also remains focused on further digitization and automation of auto casualty claim processing. Telematics-based data captured at the time of the accident provides opportunity to further enhance Straight Through Processing (STP) of casualty claims.
Earlier in Crash Course 2020, we discussed the impact of ride-hailing, car-sharing, vehicle connectivity, and incorporation of the building blocks to full vehicle autonomy on today’s vehicle repair. As the number of connected vehicles grows, capabilities to capture and analyze data collected from the growing number of sensors and software modules will help to avoid accidents altogether, or where unavoidable, provide critical information regarding damages to both the vehicle and its occupants.

That information could be used to identify which parts are damaged, the extent of the damage, pre-order the parts, and route to the repairer that best meets the unique criteria set for that consumer. Repairers must respond to a new environment of ultra-personalization and specialization. As automakers and technology companies work to craft their own “special sauce” for the “ACES,” the challenges to keep up with training and tooling will grow. Having an effective plan in place to train and retain staff will be critical. Segmenting market opportunities based on potential profit, volume, business partners, and opportunity to provide world class service will become more challenging but increasingly important. How a shop is chosen for a certain repair is likely to change, but how a world-class experience is delivered remains dependent on high quality of repair and ability to provide transparency and service throughout.

At the start of a new decade, we stand poised for immense change and opportunity.

Over the last 10 years, technology like mobile, IoT, and AI has brought dramatic change to the who, how, why and when of customer engagement. Companies across all industries have worked over the last several years to develop digital platforms that provide a unified platform experience that some now expect, where parties are connected, to ultimately deliver both transparency and saved time. And perhaps most important for our industry, these technologies have freed up talent to provide a personalized, high-touch experience, providing emotional support to those in a highly traumatic situation.

Looking forward, as new mobility options such as car-sharing, ride-sharing, bike-sharing, and autonomous vehicle technology mature, the one-vehicle to one-person model is expected to change. Traditional roles played by automakers, insurers, repairers, and other players in our ecosystem will continue to blur, and collaboration will be paramount to provide a seamless and streamlined experience. Personalized experiences are the expected norm.

While there remains much uncertainty for the future, and the ability to predict the future is perhaps more difficult than ever, understanding how to prepare for the future is paramount.

IT’S TIME.