The Connected Vehicle: Big Data, Big Opportunities
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Connected cars will outpace population growth for the next 10 years

For more than a century, the automobile industry has been a hotbed of innovation. Now, in its second century, the pace of innovation is accelerating. Connected vehicle technology is standard in many new cars. Semi-autonomous driving is a reality, with advanced driver-assistance systems enabling greater safety than ever, and fully autonomous cars are coming into service.

IHS Automotive forecasts that there will be 152 million actively connected cars on global roads by 2020. The combination of new car features and aftermarket devices could mean nearly 2 billion connected cars on the world’s roadways by 2025.

Conservative estimates from IHS Automotive state the average car will produce up to 30 terabytes of data each day.

Hidden in the data are valuable clues regarding the performance and health of the vehicle (e.g., how, when and where the vehicle is driven; the driver’s driving style and preferences, and much more).

Only by analyzing the data can you reveal meaningful connections, trends and patterns that can help provide a better driver experience and improve vehicle quality and reliability. The result is a stronger competitive position and new revenue opportunities.

The opportunities from analyzing connected car data are numerous. We’ve arranged them into six categories, shown in Figure 1. Now let’s explore these opportunities to use connected car data to achieve new levels of customer loyalty, efficient operation and revenue growth.

Transforming the customer experience

Automakers have long understood how providing good experiences helps build affinity, trust and loyalty with their customers. Personalized experiences through the web and call-center interactions have brought great returns for a number of automakers.

Now, the connected vehicle creates new opportunities to expand these investments and deliver richer, more compelling value propositions, turning their customers into advocates.

One automotive manufacturer is using automated analytics to generate personalized offers at the points of origination (financing a lease or loan). Predictive and prescriptive analytics present highly relevant, next-best action offers to create custom and personalized experiences throughout the customer lifecycle. The result is significantly increased customer response and acceptance.

Several other automakers are providing personalized goodwill offers at the point of service at the dealership and when customers escalate issues to the call center for resolution.

Predictive analytics and optimization engines account for real-time feedback from clients while using historical purchase

Market of one

At Maruti Suzuki, Rajesh Uppal is Executive Director of IT and CIO of the Information Technology Division. He says that Maruti Suzuki decided to “Market to One,” where each of its 10 million customers gets the individualized attention they deserve. This approach has contributed to nearly 3 percent growth in just seven months.

Learn more about their story.
Imagine the opportunities to use real-time data from the vehicle. Complex analytical models running in the cloud or even on board the vehicle can predict service events and notify the driver. In real time, drivers could be notified of an impending issue, in a safe and non-distracting way - and be directed to the nearest dealership with an available service bay and parts in stock - all for the convenience of the customer.

Quality and reliability

Quality has long been an element of competitiveness in the automotive industry. Today’s social media oriented world has shifted power to the consumer and has raised the profile of quality. Now quality is a key element - if not the key element - to building a strong brand reputation and customer loyalty.

But no matter how good the manufacturing process, automobiles are complex machines, and issues are often uncovered out in the field. It is critical that car companies find these issues quickly, prioritize them among other issues and resolve them quickly to minimize the number of affected customers. In this way, they reduce warranty costs and protect brand equity.

Warranty analytics has proven to be effective at identifying emerging issues several months faster than traditional warranty processes. Knowing the problem exists puts you on the road to success faster.

Volvo Truck is doing exactly that, and more. It strives to provide service and maintenance before a breakdown. Downtime is a killer for freight and logistics companies, so Volvo has adopted an analytical solution to anticipate breakdowns and other incidents and speed up repairs when necessary.

Volvo monitors quality and product warranties, analyzing more than 100 parameters to predict the wear on a component, identify abnormal events and speed up the diagnostics of incidents affecting the vehicle.

Service contracts often follow a one-size-fits-all model. The idea is that on average the risk of losing money or opportunity for making money is balanced in favor of the service provider. But it’s a delicate balance that can easily leave a company’s ledgers in the red.

A leading industrial manufacturer is using the Internet to monitor equipment status, alerting the company to situations that drive failures and costs. Understanding the variation and cost drivers under certain operating conditions allows them to optimize contracts that are more competitive, yet remain profitable.

On-the-road diagnostics

A leading heavy-truck maker wanted its transportation and logistics customers to experience zero downtime.

Its pilot project has proven successful at predicting component failures up to 30 days in advance.

What’s more, once its engineers had access to the telematics data, they had a revelation. They found three areas they could improve significantly:

On-road diagnosis

• Reduced warranty cost 50 percent per repair.
• Reduced diagnostic time 70 percent per repair.
• Increased customer uptime by 10 percent per repair.

Campaign reduction

• Reduced disruption of customer operations by 25 percent.
• Reduced warranty cost of the software update by 25 percent.

Predictive maintenance

• Address critical repairs before failure occurs.
• Increased uptime by 30 percent.
• Accelerated root-cause analysis by 25 percent.

Watch the video.
Location-based services

Point A to Point B. The whole purpose of a car or truck is to move people and goods from one place to another. Whether it’s a mom trying to get her daughter to the soccer match or the truck driver on a tight deadline to deliver her cargo, there are many things they must consider and balance:

- Current location.
- Destination.
- Schedule and timing.
- Traffic.
- Construction.
- Parking.
- Fuel level.
- Driver routing preferences.

By using a partner ecosystem, many clients are extending that experience beyond the vehicle to provide location-based offers. The range of improvements to the driving experience through greater awareness of traffic, weather, parking, gas and charging station locations are just the beginning of what will be possible in the future.

Who wouldn’t want a discount on their favorite cup of coffee in the morning driven by analytics and location?

Location-based services: what’s analytics’ role?

Most of us are familiar with graphs and reports that show trends, ratios and rankings, such as line charts, pie charts and Pareto charts. While this information is useful in telling us what happened, it falls short of telling us why it happened. And if you don’t know why something happened, you haven’t a clue of what might happen next. So you are left to use intuition, deductive reasoning and past experiences – aka your gut – to make decisions about the future.

Analytics will bridge that gap. It reveals correlations and causations. It uses sophisticated math and statistics to accurately forecast and predict what is most likely to happen. And it allows you to interject your domain knowledge to assess unprecedented what-if scenarios.

In short, analytics lets you visualize location data to provide insights that improve all aspects of your business.
Dealer services

Dealers are typically the only direct connection a consumer will have with a brand. But even though dealers are independent businesses, consumers typically don’t draw a distinction between dealer and brand. From their view the dealer, the brand and the manufacturer are all the same. Connected cars and big data offer new opportunities for the OEM and dealers to work together to provide the highest-level customer service possible.

Parts and services planning and optimization is a long-standing challenge that OEMs and dealers have faced as they strive to have the right part, in the right place, when the vehicle needs repair. The connected car enables enormous opportunity to revolutionize the service process and the customer experience.

Remote diagnostics can assess when a service or repair is needed. Then, through similarity analysis, the data pattern can be compared to known issues, the needed parts identified, and the closest (or preferred) dealer notified. When the customer arrives for his appointment, the technician with the right skills is available, with the right parts to fix it fast and minimize any inconvenience for the customer.

On the dealer and OEM side, analytics can detect patterns and trends across the vehicle population and help forecast and optimize spare inventory to minimize carrying costs while improving fill rates. This is a big win for regular break-fix scenarios, but will revolutionize and streamline recall campaign coordination, keeping costs low and shortening the campaign cycle.

Dealer locations and marketing territories have historically been based on where vehicles are parked when not in use. With connected vehicle data, OEMs and dealers can have better insight into where vehicles actually operate - where people work, go to school, run errands, etc.

By marketing to drivers in their own driving territory, dealers can offer more convenience to customers, or identify where they need to open a remote servicing center or maybe even relocate the dealership itself.

Streamlined procedures

Earlier, we learned about a truck maker who is using telematics data to improve the performance and reliability of its trucks, and improving the customer experience along the way.

While engineers were diagnosing emerging issues and rationalizing campaign candidates, they found something else. Prior to seeing the telematics data, they issued instructions for complicated and laborious diagnostic procedures at the dealership due to the component system’s complexity.

Since the truck’s trouble codes could be analyzed in advance, the procedures at the dealership could be streamlined, shortening the visit and getting the truck back on the road sooner.

More efficient dealers and happier customers, all through analytics.

Analytics can allow dealers to visualize these patterns and optimize their business through what-if analysis.

The showroom of the dealership is undergoing a transformation as well. Technology like iBeacons and other near-field communication devices allow a customer to be tracked through the physical world, much like online tracking has done for years. Knowing that a customer keeps circling back to the shiny red sports car could be a profitable insight. Analytics can measure shoppers’ activity, enabling dealers to make the right offer at the right moment, such as more vehicle option information or a test drive as further enticement. Sales personnel will be more productive and the customer shopping experience will be more relevant and compelling.
Infotainment

The average American commutes to work more than 25 minutes each way. However, in many communities, particularly more densely populated areas, drivers can have commute times of more than an hour. Add in transporting the kids to activities, running errands and the annual family trip, and the tally quickly rises to thousands of hours per year sitting behind the wheel.

Information and entertainment in the car is nothing new. Music and cars have been culturally linked:

- Radios began to appear in cars in the 1930s.
- FM radio made an early appearance in the ‘50s.
- Eight-track tape players came along in the mid-‘60s.
- The cassette deck debuted in the ‘70s.
- The first factory CD player appeared in 1985.
- Satellite radio got its start in the ‘90s.

Now, you can connect almost any digital device that plays audio to your car’s infotainment (information + entertainment) system. And what parent hasn’t expressed thanks for built-in movie players that have brought peace and quiet to backseats all over the world?

Mobile Wi-Fi connectivity is quickly becoming commonplace and has brought streaming services for news and entertainment into the car. Much like media and mobile companies are analyzing consumption of content to understand and predict customer needs, in-car infotainment holds similar opportunities to monetize usage data.

Pair the infotainment data with vehicle data – location, length of average trip, miles driven per week, number of passengers, date, day of the week, etc. – and opportunities to provide richer, more fulfilling experiences in (and out of) the vehicle become possible (and profitable). Here are some ways to capitalize on that data:

- **Recommended content.** Short-form content may be suggested on Monday afternoon when you’re shuttling the kids to soccer practice, with longer-form on Saturday when you typically drive to the beach.
- **Mobile payments.** Pay-per-view movies and live sporting events (for the backseat passengers, of course).
- **Intelligent messaging.** Breaking news, traffic and weather reports based on actual travel patterns.
- **Live content transfer.** You’ve arrived at your destination; wouldn’t it be great to continue watching on your tablet or the television inside?

This is just the beginning. While the opportunities evolve, one thing is clear - analytics will be the foundation of providing unique and personalized experiences to drivers and passengers to enrich their use of apps and technology. Analytics can assess disparate data sources to understand the correlations and patterns, then determine the next-best offer, in real time.

The ultimate mobile device

The mobile market is revolutionizing the way we do business, especially marketing. And the car is the world’s ultimate personal mobile device.

“If you’re not investing in mobile, you probably won’t be in business in five years’ time.”

- David Sear, CEO of Weve

Weve, part of O2, is a leading UK provider of mobile marketing and commerce. It combines and analyzes real-time data streams from 17 million mobile users for intelligent messaging and mobile commerce campaigns. Location data, along with purchase history, daily routines and social data that users make public are used for:

- Intelligent messaging.
- Targeted offers.
- Mobile payments.

Read the story.
The driving experience

Programmable seats, preset radio stations, driver information centers, heads-up displays, adaptive cruise, lane departure notification – today’s cars are filled with technology aimed to personalize the experience and help drivers operate their cars more safely. All of these are wonderful, necessary innovations. But they are either predetermined or need to be actively managed in order to be personalized.

But what if the car learned the driver’s preferences? You like to listen to the news in the morning to be informed on the way to work and classical music on the way home to relax. You take more risks during the week commuting, and are more safety-conscious on the weekends, or when the kids are in the car. Most Fridays you take a detour on the way to work to meet a friend at the coffee shop.

These patterns, and even more complex patterns, can be revealed through analytics and a new experience provided for the driver. One that adapts to the driver’s needs.

So now, when the driver gets behind the wheel go to work on Friday, the radio is set to public radio, the transmission is set to sport mode and the navigation system warns her of an accident along the normal route and recommends an alternate to get to the coffee shop on time.

While providing a unique experience can make driving more enjoyable, the priority is keeping the driver and passenger safe.

What if the navigation system could assess the accident risk for your route and guide you to a safer path or alert you to be extra cautious – or maybe adjust the onboard accident-avoidance features to be more sensitive?

Many cars have temperature sensors and warn of possible icy conditions. These are very rules-driven: If temperature falls below 37 degrees F, then issue a warning. But what if your tires are not properly inflated or have excessive wear, you’re carrying a heavy load or there is a recall on your brakes – these and other factors could affect whether you are more or less likely to have an accident under icy conditions. Analytics could assess all of the related factors, assess your risk and prompt you to take action to reduce it.

The problem is that the world is too unpredictable to account for every scenario and every factor. Analytics can help detect new patterns and offer a best decision or outcome.

Saving lives

More than 3,000 people die on the world’s roads daily. Israel decided to do something about it. It commissioned a study to investigate the effectiveness of a collision avoidance system (CAS) – an auto-safety system designed to reduce accidents. CAS uses radar, lasers and camera systems to detect imminent crashes. The system either warns the driver or acts on its own to brake or steer (or both) to avoid a collision.

The results were startling:
• Insurance claims dropped by nearly 44 percent.
• Insurers could reduce the price of insurance for CAS-equipped vehicles by up to 15 percent.
Streaming analytics drives success

As we stated earlier, a single connected vehicle can produce more than a terabyte of data per hour of operation. With tens of millions of units in operation, how do you manage such a torrent of data? Where would you store it? How long would it take to process it? Even with cheap storage options, it is not plausible to collect and store all of that data.

The answer is to forget the traditional approach.

Analyze it on the fly. Rather than bringing the data to the storage and analytics, bring the analytics to the data. This method can go by many names, but it is most commonly referred to as streaming analytics. With streaming analytics, you can:

- Spot meaningful trends, patterns and correlations in the data. No need to transmit and store status quo data.
- Aggregate or score data. Perhaps groups of variables, or a calculated value across multiple data points, are important to know. Calculate it on data near the source and only transmit the results.
- Run complex analytical models for predictive and prescriptive decision outcomes.

Find what’s meaningful, grab only what you need, get instant insights to react immediately, and make the best decisions as data flows by. With a solution that constantly analyzes events as they occur, you can detect patterns that are otherwise lost through information lag.

For instance, SAS partnered with Duke Energy and North Carolina State University to analyze data streaming off distribution grid devices, called PMUs. More than 100 of these devices, each of which generates about 30 readings per second, are spread across most of the United States.

Streaming analytics is able to forecast expected values just a few seconds into the future, and compare actual to forecasted values to identify meaningful deviations that may indicate a problem that will lead to power outages.

Read more about this amazing project.

This project highlights the capability to perform complex analysis on high-volume, high-velocity data. Likewise, the opportunities for streaming telematics and connected car data are endless.

Real value in real time

Across our research and experience, we’ve seen strong value from connected devices and analytics. Below are a few metrics published in this area:

- 65 percent greater uptime versus unconnected fleet.
- 40 percent lower average repair time.
- 54 percent year-over-year service cost improvement.
- 10 percent lower service cost for connected fleets.
- 10 percent operating cost reduction.
- 14 percent scrap reduction.
- 70 percent reliability increase.