WHITE PAPER
OPPORTUNITIES AND CHALLENGES FOR BIG DATA IN THE AUTOMOTIVE INDUSTRY

T·Systems
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CURRENT INDUSTRY CHALLENGES

A good product and a strong brand are the bare essentials for survival in the highly competitive automotive world. The industry is facing a host of challenges that cannot be tackled with design, development, and production excellence alone.

Like 2012, the year 2013 is being shaped by economic instability. In Europe, the economic gap between north and south is widening, and volatility is increasing in key Asian and North American markets.

Add the ambitious emissions and fuel consumption targets of governments around the world, which require businesses to invest considerable time, effort, and money, and the result is a still tenuous trend toward alternative drive systems – one that could be short-lived. Indeed, there has only been a lukewarm response among consumers to these innovations. The sales figures across the board are far below expectations, even in markets where policymakers have provided incentives. Overall, it is becoming more difficult to predict the future model mix or the number of individual model options and drive technologies that will be sold. Economic risks increase as a result, despite all the flexibility. "We are continuing to drive by sight" – said a well-known automotive executive recently, describing the situation.

Perhaps this current phase of reorientation in the wake of the alarm over climate change and the peak in the financial crisis is the perfect time to take up some of the industry’s most pressing challenges. A number of these are discussed briefly in the following.

CUSTOMER RELATIONS IN THE AGE OF SOCIAL MEDIA

Today’s car buyers not only expect perfect quality, they also want durable vehicles, a comprehensive warranty, and agreeable goodwill policies. At the same time, consumers increasingly want to see more mobility-related features that go beyond the vehicle and include other modes of transport. Is the automotive industry capable of delivering what they want and really need? Generally speaking, authorized dealers are the automotive industry’s face to the customer. Manufacturers themselves get to know relatively little about the people who actually drive their vehicles – in some cases, their first point of contact is when an order is placed.

In today’s Internet age, manufacturers increasingly find ways to interface with customers, especially prospective buyers – think of all the websites that include car configurators and options to order vehicle specs and brochures or schedule a test drive. While some may have made generally feeble attempts to establish direct online sales, manufacturers remain dependent on dealer services when it comes to the actual initiation of a sale. If the dealer-customer relationship sours, manufacturers often only get wind of it indirectly – in online forums and on social media.
The flip side to that coin is that today’s consumer is far better informed than ever before thanks to social media and the new forms of communication that come with it. The information gap between dealers and customers – once a fact of life – has now been closed for a large share of the consumer base. Some buyers today know more about certain product features than dealers – which is not surprising considering that, for most people, buying a car is the biggest purchase they will ever make, aside from a home.

The Internet has brought about another change: customers today typically have no qualms about spreading the word when they have what they consider to be an unsatisfactory experience with a product, sales or service. After all, social media is all about sharing. OEMs recognized this quite a while ago. Most have long since added social media monitoring to their toolboxes. But despite all the efforts, this doesn’t mean they have solved the problem: it’s undeniably difficult to filter through this cyber chorus of voices and respond to real concerns. For example, each day the Twitter world alone sees more than 500 million tweets.1

RECALLS

One of the most hotly debated topics on the world’s top automobile forums is product recalls – a carmaker’s worst nightmare. In addition to the enormous cost of ordering thousands of vehicles back to dealerships, a recall nearly always damages a company’s carefully choreographed and cultivated image. According to industry figures, Japanese automaker Toyota recalled about 10 million vehicles between 2009 and 2010 – for relatively trivial errors such as loose floor mats and sticky gas pedals. Though the majority of the recalls took place in North America, more than 200,000 vehicles were affected in Germany. And it affected all models – from the tiny AYGO to the RAV4 crossover SUV.2

In 2011, Toyota recalled more vehicles on account of problems with the floorboards and the floor mats. The damage was huge from a PR perspective, even though, interestingly enough, information favorable to the company was more persuasive than unfavorable information, allowing Toyota to rely on fundamentally positive consumer sentiment.3

The multiple recalls of millions of vehicles for the same problem – at least that’s how it appeared to the general public – not only demonstrate the potentially negative impact of a platform strategy: a closer look reveals that this was a prime example of missed opportunities to collect and analyze data.

Long before the recall, reports from drivers had swelled on diverse web forums and social media platforms, not to mention direct customer contact, as evidenced by actual complaints at dealerships.4 At no time did Toyota respond. They were apparently unable to read the all-too-clear warning signs, much less react.

Before the floor mat debacle, Toyota did not have an active social media strategy. Likewise, the company did not have a real system in place to obtain relevant feedback from dealer-customer interactions.

Today, there is a general consensus across all industries that social media is important to business and companies ignore it at their peril. Until only recently, a routine (manual) cruise through the top forums, typically once a week, would suffice. Nowadays, professional monitoring tools are necessary to collect, funnel, and analyze the enormity of it all. The problem is not only the huge amount of sources and individual content, but above all the lack of any level of structuring.

1) [Source: CNET] Report: Twitter hits half a billion tweets a day, 2012
2) [Source: Toyota] Fragen und Antworten für Toyota Kunden: Rückrufaktion “Gaspedal” für Toyota in Europa, 2010
3) [Source: Institute for Public Relations]
4) [Source: UT San Diego] Prior Driver of Lexus says pedal stuck, 2009
When talking about social media, it’s important not to forget that user expectations have skyrocketed in recent years when it comes to response times. No response – or a delayed response – to something the ‘online community’ feels is relevant can do more damage than the statement itself in some circumstances. It is not without reason that social media experts talk about the dangers of a “shitstorm.”

**DIAGNOSTICS AND MAINTENANCE**

While the goal in terms of product recalls is quite frankly to avoid them, maintenance is all about optimum organization. The average new or young vehicle is serviced once every one to two years. Each time, vehicle data is collected, which provides the manufacturer with valuable information that can be used for development, warranty claims processing or even requests for goodwill. Basically, cars have been able to talk for quite some time, but people just haven’t really been listening.

A car is typically “offline” for months even though modern on-board systems extend or shorten the maintenance intervals, depending on the need. Looming defects in individual vehicles or even complete lines of vehicles may thus be detected rather late – in some cases too late, meaning after the problem has already become manifest. In a permanently connected vehicle, the maintenance interval could be optimized and manufacturers could potentially order a vehicle in for service before a suspected defect causes trouble. What’s more, software updates could be used to remotely remove errors and optimize the system. This ongoing, anonymous monitoring of vehicle operating data can generate new knowledge, especially in hybrid and electric vehicles, where manufacturers are still faced with a steep learning curve when it comes to user and system behavior. The trick is to construct real meaning out of the data.

**NEW USE MODELS**

While an Internet connection and ongoing data evaluation can be seen as adding value for diagnostics and maintenance, there are increasing automotive use cases that wouldn’t even exist in a world without connected vehicles.

The most well-known of these cases is the new form of car sharing in which drivers pick up and park the rental vehicles anywhere within a defined area. This business model not only requires permanent Internet access and the ability to process information, intelligent networks and data evaluation are just as essential for competitive edge and, in the end, the bottom line.

The same goes for other new, location-based, vehicle-related services. One example is insurance that is based on a driver’s actual driving behavior (Pay As You Drive, or PAYD). The mobile communications and especially the Internet markets have long since recognized the value of data – especially location-based data – and know how to use it. Other industries can learn from them. Many scientists are working on forecasting models in order to predict human behavior in the future.

Albert-Lázló Barabási, an IT expert from the Hungarian Center of Complex Networks, reports (in his presentation at the DLD13 Conference in Munich) that even on the basis of transactions collected anonymously over a period of two weeks alone, one can create a profile that can predict with up to 93 percent accuracy the future movement behavior of a subject. That is an exciting discovery for many newly established use models in the industry – or those in the works – especially the car sharing model mentioned above. This groundbreaking business typically does not provide fixed rental locations for its vehicles. Instead, drivers can park their rental car anywhere within a defined service area. The next driver locates an available vehicle using a smartphone app or Internet application and later parks it somewhere else within that same defined area. For the system to function and to avoid frustrating customers, the distance between available cars needs to be kept to a minimum. But this does not always work out in practice and vehicles don’t always end up near where they will be needed next. By leveraging transaction data, car sharing companies predict where a vehicle might be needed based on anticipated customer behavior and move the vehicle accordingly. This all takes place by analyzing completely anonymized data.

Whichever way you look at it, many of the automotive industry’s most pressing challenges today are fundamentally about collecting and intelligently analyzing data. It’s simply not enough to process data from ERP and CRM systems and maybe add the web statistics of existing online applications. All available data sources – including vehicle, social media, and customer relations data – must be aggregated, leveraged, and exploited.

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5) [Source: YouTube] DLD13 – Clipping of BURST, 2013
People have been talking about the information age for decades. Depending on who is doing the talking, the transformation from the industrial to the information age took place in the 1970s, 1980s or early 1990s. Commercial Internet access, such as digital mobile communications, has been in place now for 20 years. The forefathers of today’s PCs date back more than 30 years.

It’s impossible to compare the huge streams of data today with those seen when the information age was in its infancy. The increased connectivity between people and business as well as between devices has brought an enormous surge of information, as has the growing acceptance and use of smartphones and social media. According to market researchers at IDC (Big Data Webinar on December 11, 2012), the number of connected devices will triple between 2010 and 2015 alone, and the amount of data they generate will increase by a factor of six.

The increasing digitization and connectivity of modern vehicles – together with connections to the OEMs – are generating an associated increase in the volume of data available for analysis in the automotive industry.

Axel Deicke, Vice President Aftersales Service Technologies at BMW Group, talks specifically about an increase in incoming data from approximately 20 GB per year (in 2011) to now 30 GB per day – and that is at BMW alone. Plus, his statistics exclude information from market research or customer service.

Erol Gökçek, Head of Industry Solutions Automotive & Mobility at Deutsche Telekom AG, is convinced that these figures are only snapshots. He expects – based on current OEM requirements – the monthly data traffic per vehicle to increase from approx. 4 MB to 5 GB in the next few years.

The actual amount of information will depend particularly on user behavior, i.e. the time drivers and passengers spend in their vehicles, the number of applications in the vehicles (including M2M), and last but not least the available bandwidth.

If one accounts for the increasing number of connected vehicles, then it’s clear that data traffic will skyrocket. According to a study conducted by the consulting firm Oliver Wyman, 80 percent of all vehicles sold around the world will be connected as early as 2016. This means some 210 million connected vehicles will be on the roads worldwide. Compared with 45 million cars in 2011, this would be an annual growth rate of more than 36 percent.

Data Growth Through Connected Vehicles

![Data Growth Through Connected Vehicles Graph]

FIG. 1 Source: T-Systems (own figure)
Driving this development – as illustrated in the figure above – are both the number of connected vehicles and the volume of data per vehicle. The figure does not depict one aspect that is just as important for Big Data applications: the number of reasonably possible interconnections between the data. Yet many companies incorrectly assume that they simply need “more memory” to tackle increasing amounts of data. The IDC European Vertical Markets Survey 2012, for example, polled 1,600 people and asked the question: “How will the increased data volume affect your company/organization?” The results were as follows:

- 29.2% see a need to re-evaluate information management processes
- 44.1% say they can handle it by expanding memory capacity
- 19.5% see only limited or no effects
- 7.3% do not know / did not specify

Fewer than 30% of those surveyed see Big Data as an opportunity, recognizing – as described above – that it is more than simply an increase in information volume. It is critical to derive the right meaning from and potential correlations among the streams of data.

The complexity of it all increases dramatically with the addition of each new data object – an exponential increase in some cases, because new objects always form new relationships with existing objects.

No matter what applications come into play, OEMs are in the best position to systematically collect the data – as indicated at the beginning of this paper – to gain a competitive edge over direct competitors and new players in related markets.

BIG DATA BASICS

The IT sector talks about Big Data as if it were something new and mysterious. What does the term actually mean? As IT experts, we tend to immediately suspect just another hype in the making. But in this case it’s worth taking a look at what’s behind all the hype. The term Big Data refers to huge volumes and wide ranges of data, especially unstructured data that cannot be sufficiently captured and analyzed using conventional databases and analytics tools.

Computer-generated data is the primary reason for skyrocketing data volumes in recent years. In its report “The Digital Universe in 2020,” International Data Corporation (IDC), a market analysis firm, predicts the amount of data will grow to 40,000 exabytes by 2020.8

Social media usage will also continue to increase, especially on smartphones – a trend that will have an impact on the amount of information available for analysis. Interestingly enough, the data found in “digital shadows” – the trail users leave behind as they maneuver through the Internet – is larger than the text, image, and video information users upload themselves.

However, at the end of the day, does a higher quantity of data mean a higher quality of results?

**THE THREE “Vs”**

The IT world generally talks about Big Data in terms of the so-called three “Vs.”

- **Volume** – considerable growth in the amount of data is anticipated, in particular from connected vehicles, but also from social media.
- **Velocity** – the faster potential correlations are detected and the right conclusions are drawn, the better the result. The goal is (near) instant availability – basically in real time.
- **Variety** – the wide spectrum of both structured data (e.g. measured data) and unstructured data (e.g. e-mails or social media messages) as well as voice and video.

Those old IT professionals who suspect this is a case of serving up “old wine in new bottles” are not too far off the mark. Indeed, the three Vs, which are now used to define what we call Big Data today, have been in use for years. They were originally coined back in 2001 by Meta Group – a business analytics firm that is now part of Gartner. In a research note, analyst Doug Laney was the first to write about how the “three Vs” would be essential for data management in the future. Of course, the term Big Data was not yet a part of the IT vernacular at the time. It was only through technological advances that it became possible to not only collect what we call Big Data today but also to analyze it more or less in real time and draw the right conclusions from it.

And it doesn’t stop with the three Vs. IT providers and analytics firms are working in a number of directions to further develop the approach. Research company Experton\(^\text{10}\) thinks, for example, that there should be five Vs. They define the two additional Vs as follows:

- **Veracity** – the reliability, integrity, relevance, and usability of data.
- **Value** – the benefit generated by data.

Now what may look like a race to win first prize in an alliteration contest can be described in another way – without any Vs. The Business Application Research Center (BARC) – a consulting firm specializing in business intelligence – defines Big Data as follows: “Big Data describes methods and technologies for highly scalable integration, storage, and analysis of poly-structured data”.\(^\text{11}\) Note that this definition explicitly mentions methods and technologies but not tools. Highly scalable in this context means large volumes of data and numbers of users, complex queries, and rapid data updates. Poly-structured stands for structured, semi-structured, and unstructured data – basically every data structure currently in existence.

**FROM BUSINESS INTELLIGENCE TO BIG DATA**

Regardless of how it’s defined, the fundamental difference between the Big Data and Business Intelligence (BI) approaches to data analysis lies in a number of dimensions. BI centers on the repeated analysis of structured data. Data from business transactions, in-house applications, mainframe systems, existing databases, and ERP systems is compiled in a “data warehouse.”

Big Data builds upon this information to include other sources that are mostly unstructured, including data from sensors (e.g. data from vehicles or RFID), social media, text (e.g. e-mails), and even images, voice, and video. In order to manage the analytics of all this data, new methods of analysis are necessary and the right expertise a must.

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<th><strong>BIG DATA METHODS (SAMPLE):</strong></th>
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<tbody>
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<td>• A/B testing</td>
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<td>• Association rule learning</td>
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<td>• Classification</td>
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<td>• Cluster analysis</td>
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<td>• Crowdsourcing</td>
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<td>• Data fusion and integration</td>
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Through all of the excitement surrounding the variety and velocity of the analytics, one cannot lose sight of the fact that the results have to packaged to meet user needs, including presenting personalized snapshots of the analyses for users on their smartphones (small data).

\(^9\) [Source: Gartner] Déjà VVv: Others Claiming Gartner’s Construct for Big Data, 2012
\(^10\) [Source: Experton Group]
THE VALUE OF DATA

There is no single answer to the question about Big Data’s return on investment (ROI), the value of the data collected or, better yet, the analysis of it. McKinsey forecasts that retailers using Big Data to its full potential could increase margins by 60% (see June 2011 report “Big Data: The Next Frontier for Innovation, Competition, and Productivity”). Although the report does not distinguish between individual retail segments – the automotive industry is not listed separately – it is no secret that any measurable margin increase is a welcome development if one considers that ROI averages a modest 2.1% (figure from fiscal year 2012).

In fact, we need to dive deeper in order to estimate the earnings potential of Big Data. For instance, how much can be saved by detecting an error early and avoiding a product recall? How much value can be attached to new services that are mere extras in the greater scheme of things now, but will likely drive growth in the future?

DATA PROTECTION AND SECURITY

Here, too, the excitement of adding value through data analytics cannot allow us to lose sight of the fact that there are legal issues – or at least ethical concerns – to contend with. In June 2012, for instance, there was a public outcry when word got out that a research project, which German credit investigation bureau Schufa had contracted to the Hasso Plattner Institute, was seeking to find out whether social media could be mined to inform credit checks – a classic Big Data approach, albeit not from the auto industry. Likewise, telecommunications provider Telefónica was forced to put its plans to sell user location tracking data in Germany on hold, at least for the time being. The automotive industry also has seen its share of examples of the potentially explosive nature of Big Data:

- Electric car manufacturer Tesla faced criticism in the past when the public became aware of the fact that the company could not only read usage data, as indicated in the manual, but could also locate its vehicles remotely, a fact that was nowhere to be found in the product information.13 Tesla tried to explain the lax and in some countries clearly illegal use of customer data as the result of American entrepreneurialism. Nevertheless, a reputable vendor or service provider has to disclose these things in advance and give users the opportunity to object.

Besides the question of data protection, Big Data touches upon a number of legal issues:

- Business and trade secrets
- Copyright concerns in some cases
- Data protection law – applicable only when personal data is involved
- Traffic data
- Criminal law: data espionage or phishing
- Integrity of IT systems
- Protection provided by the general right to privacy

All in all, legal support is advisable.

12) [Source: Autohaus.de] Erträge in Autowinzen deutlich gestiegen, 2012
13) [Source: theunderstatement]
14) [Source: nrc.nl] TomTom speelt gegevens door aan politie, 2011
15) [Source: TomTom]
BIG DATA IN THE AUTOMOTIVE INDUSTRY

THE ESSENTIALS FOR LEVERAGING BIG DATA IN THE AUTOMOTIVE INDUSTRY

The examples mentioned above represent several specific applications, which some may not immediately associate with Big Data, but essentially follow the approach to a tee. There are a number of prerequisites for leveraging Big Data successfully. These include:

- A fundamental understanding of Big Data within the organization
- The availability of data
- The availability of IT resources and know-how
- The availability of data analytics specialists

The initial hurdle is developing an awareness of the opportunities and potential benefits of Big Data. The authors’ experience has shown that, as engagement in the topic increases, the interest takes on a life of its own. That said, the right person in upper management needs to be on board if the approach is to spread throughout the company. Some may think that the availability of data happens for the most part all by itself. And they would be right. In fact, much of the potentially relevant data is already available – what’s needed is simply a system to collect and leverage it. Other data sources, such as information streams from cars or social media platforms, must first be tapped into or acquired from other companies – with possible legal implications.

Another essential factor is the availability of IT resources. All too often, day-to-day business and other urgent projects get in the way of new topics like Big Data. That’s why it’s so important to get the buy-in from a top executive who can help appropriate the necessary resources.

The most important hurdle, however, is access to data analytics experts. They are few and far between and not on most companies’ payrolls. According to Accenture, there will continue to be a shortage of experts in this field. In the short term, there is no relief in sight, but companies can plan for this and take selective action to improve their own situations. Some of these include increasing the attractiveness of analytics positions, creating flexible career paths, and employing external service providers.

Overall the outlook is good. McKinsey compared a number of industries to see which were best positioned to capture the value of Big Data. It sees the automotive industry – alongside the IT and energy industries – as one of the most suitable for leveraging Big Data, irrespective of the shortage of professionals in the field (see heat map on page 10 of McKinsey’s report on Big Data). The most obvious recommendation is missing from this report, however. Given the shortage of IT resources and available analytics expertise, it’s advisable to partner up with a provider that has experience with Big Data and ideally with applying it to the automotive industry.

BIG DATA APPLICATIONS IN THE AUTOMOTIVE INDUSTRY

There are many potential facets to Big Data in the automotive industry. The pioneers are just now beginning to blaze trails to new discoveries. The following is therefore by no means an exhaustive list but an invitation to ponder one’s own potential applications.

16) [Source: Accenture] Where will you find your analytics talent?, 2012
BIG DATA FOR PRODUCT OPTIMIZATION

Actively responding to customer feedback – such as monitoring social media channels – can play a vital role in improving how companies meet customer expectations, which will enhance customer satisfaction. The use of Big Data analytics to optimize products should start at the product development stage. This might include analysis of test data and comparisons to data from previous tests in order to “connect the dots.” This allows issues that relate to past problems to be analyzed, the root causes identified, and suitable action to be taken. During a test, the data collected as well as additional notes from the test engineers can be automatically evaluated, analyzed, and compared with similar experiences across the company – with a constant eye on preventing errors and avoiding recalls to the greatest extent possible.

BIG DATA IN AFTERSALES

In the aftersales market and during the warranty period, Big Data can help – for instance, through detailed, anonymized analysis of consumer behavior – to optimize the maintenance interval, schedule needs-based service, and generate a truly personal approach to advertising. Likewise, Big Data is well suited to monitor products throughout the warranty period for anomalies and more or less “sound the alarm” when there is an indication that service may be needed.

The old adage still applies today: “Sales sells the first one, service sells the rest.” Sophisticated use of the data derived from customer behavior and service helps to better manage the aftersales process and, with it, customer satisfaction, as well as increase utilization of authorized repair shops, not to mention the number of loyal repeat buyers.

BIG DATA AND E-MOBILITY

Another typical application for Big Data that presents a new challenge due to its high complexity is electric mobility. The following is an example of the potential data analytics present in this field: The Austrian government’s VLOTTE project includes a fleet of 357 electric vehicles, which to date have clocked up a combined total of four million kilometers. Currently, the project is testing the platform AutoLinQ for Electric Vehicle, which automotive supplier Continental has developed in partnership with T-Systems. The AutoLinQ technology enables vehicle localization, location tracking, diagnostics, and status information of vehicles, batteries, and environment, as well as controlling the charging process on a standard electrical socket, locating charging stations, and integrating third-party functions. Using an app, VLOTTE customers can locate an electric vehicle, manage and control the charging process as well as read out a variety of data, such as consumption. What’s more, by analyzing the ongoing data streaming provided by all vehicles via AutoLinQ, the fleet operator is gathering valuable information about e-mobility operations. Manufacturers can benefit as well. Given that the rather sluggish market for electric vehicles continues to be plagued by the question of range, a detailed analysis of the actual behavior of real drivers can help to provide the necessary impetus for further product development and to improve selective marketing.

OTHER APPLICATION AREAS

At the outset, this paper alluded to the fact that Big Data need not be limited to existing systems and processes. Instead, it can open up new application opportunities – especially for OEMs – or even establish new business streams, such as the development of new types of services for connected vehicles.

Also mentioned were Big Data applications like car sharing as well as user-based insurance services such as Pay As You Drive (PAYD). Other potential application areas include location-based services, such as providing local weather information. And it doesn’t stop there: traffic warnings (accidents, road conditions, etc.), parking space locators, and reservation services or even intermodal navigation that integrates other means of transportation (bus, train, and plane) – the list goes on. Beyond that, one can even imagine cooperation alliances with partners and the development of entirely new business ideas. Perhaps one day in the future, drivers will receive messages like this on their on-board display: “Traffic jam ahead; anticipated delay: 18 minutes; try the new McCafe – just off the next exit. Here’s a coupon for 50 cents off a latte.”
CONCLUSION

Applying Big Data in the automotive sector not only promises cost savings, it also provides exciting and potentially very lucrative ways to expand a company’s business model. If done right, Big Data can definitely help OEMs to establish and optimize direct relationships with the consumer.

“Zero Distance” is the new proximity to the customer that is a decisive competitive factor and the ideal basis for long-term customer loyalty. Calling data the “oil of the 21st century” has long been more than just a popular expression. Now is the time to look into the potential current and future applications in vehicle development, production, sales, operation, and maintenance and, in the process, minimize the intrusion of industry outsiders like Google and others like it.

It’s important to take heed of data protection law right from the start in order to avoid unwanted media attention from ill-considered activities. This applies especially to the data-protection-conscious markets in Europe. Likewise, think about how customers and fans can be actively encouraged to embrace the brand when, for instance, using crowdsourcing to invent new concepts and when putting the data to use afterward.

In this age of sharing and participation, be prepared that some end users will very openly claim their “right to participate” and, for instance, demand that all data formats and databases that affect them be made available. In the case of the Tesla Roadster, for example, users are already circulating instructions on how individuals can evaluate the data themselves. One of the company’s first customers and a huge fan reverse engineered the file formats and published them online.¹⁷ Expect this and more when working with Big Data. The “age of exclusivity” – at least in the eyes of users – has long since passed. Here, too – if done right – greater user participation will lead to the “zero distance” companies should be striving for, not to mention greater customer loyalty.

A partner with expertise in Big Data and experience in the automotive industry can, in the end, not only help a company tap into the potential of Big Data early and make up for the shortage of data analytics professionals in the foreseeable future, it can also help a company avoid the pitfalls awaiting them when it comes to leveraging the value of implementing Big Data.

¹⁷) [Source: myBitBox] Tesla Roadster Log Parsing, 2010
LIST OF FIGURES

FIGURE 1  DATA GROWTH THROUGH CONNECTED VEHICLES
FIGURE 2  GROWTH IN DATA VOLUME