Honda R&D
Designing better, safer, more personalized automobiles with big data analytics

Honda R&D is the research and development wing of Honda, one of the world’s largest manufacturers of automobiles and motorcycles, and a pioneer in robotics and other advanced technologies. In the automotive space, Honda R&D’s mission is to develop technologies that maximize the joy of driving.

Business challenge
Honda R&D knew that vehicle sensors, customer surveys and other sources of big data were potentially rich sources of insight. How could it help its engineers unlock the value of these vast data-sets?

Transformation
Honda R&D is training its engineers to use advanced IBM Analytics tools, helping them collaborate to understand driver behavior, increase reliability and design a more personalized driving experience.

Business benefits:
Over 100
Honda R&D engineers are now trained in big data analytics techniques

10 minutes
to analyze over a million documents and highlight examples of driver behavior

Saves costs
by helping different teams share and re-use data

“IBM Analytics helps us explore big data and ultimately design better, smarter, safer automobiles.”

Kyoka Nakagawa
Chief Engineer
TAC, Honda R&D Co., Ltd.
Automobile R&D Center
Innovation needs an open mind

Honda is one of the world’s most innovative companies, as anyone who has witnessed its work in robotics can testify. The same mindset applies to every division of its business: Honda’s engineers constantly strive to design and build the smartest, most technologically advanced products on the market.

In the automotive space, Honda aims to become the premier manufacturer of interesting, cleverly designed cars that enable customers to experience the joy of driving. To this end, it invests billions of dollars per year in its research and development organization, Honda R&D.

Several years ago, Honda R&D realized that new sources of big data – vehicle diagnostics and telematics, smartphones, biometric sensors and large bodies of unstructured text such as customer surveys – had great potential value. By unlocking the insights hidden within these huge data-sets, the company’s engineers would be able to look beyond their test facilities and gain a better understanding of how cars and drivers behave in the real world.

To help its engineers harness these big data assets, Honda R&D needed two things: a comprehensive set of big data analytics tools, and a group of engineers with the skills and enthusiasm to use them.

Kyoka Nakagawa, Chief Engineer, Technical Analysis and Countermeasure at the Honda R&D Automobile R&D Center, and Senior Researcher for the Market Quality division, comments: “Engineering is a very precise discipline, and engineers are accustomed to working with very high-quality data, often captured in laboratory conditions.

“But big data isn’t like that – it is messy, and often the valuable insights are hidden in a lot of irrelevant data. So one of the biggest challenges was a cultural one: we needed to show our engineers how valuable big data can be, when you have the right tools to deal with it.”

Guiding the big data journey

To find the best way to introduce big data analytics technologies into its research and development processes, Honda R&D wanted to work with a technology partner that could offer a truly comprehensive service.

Kyoka Nakagawa comments: “IBM was the right choice of partner for two important reasons. First, IBM offers a very broad range of big data analytics capabilities, including data mining, text analytics and visualization – so we were able to get all the tools we needed from a single vendor. Second, IBM had the skills and experience to guide us all the way through our big data journey, from consultation through proof-of-concept to final realization.”

Honda R&D’s big data analytics environment is based on IBM® SPSS® Modeler, IBM Watson™ Content Analytics, and IBM Predictive Maintenance and Quality (PMQ). Kyoka Nakagawa’s role is to act as a networking hub for these technologies, helping to set up proof-of-concepts, organize training courses, and encourage engineers to share their knowledge, experience and data.

“Learning about big data analytics has also helped some of our engineers think outside the box.”

Kyoka Nakagawa comments: “The data mining training courses have been very successful – IBM SPSS Modeler has quickly become a popular tool throughout the business. More than 100 engineers have now completed the training, and many of them use SPSS regularly in their work.

“SPSS Modeler is very good for organizing raw data into usable data-sets, so that it can be analyzed easily. It is also very easy to use for complex analyses. Another valuable feature is the ability to monitor users and see how they are interacting with the tool. So if someone is struggling to manage their data effectively, colleagues can give them some extra help.”

Honda R&D uses IBM Watson Content Analytics for text mining – giving researchers near-instant insight into vast stores of documents and other textual data. For example, the JD Power Initial Quality Studies and Honda R&D’s in-house voice-of-customer studies are very valuable sources of information on automobile quality and reliability over time. In the US, the National Highway Traffic Safety Authority (NHTSA) also provides a rich source of insight into consumers’ problems and safety concerns.
Kyoka Nakagawa gives an example: “We recently had a meeting where an executive asked a question about a feature of one of our cars. We logged into Watson Content Analytics, analyzed over a million records in the NHTSA data-set, and within 10 minutes we had found three or four examples of relevant feedback from customers. This is the kind of analysis that would be almost impossible to perform manually.”

The IBM Watson Content Analytics solution runs on SoftLayer®, IBM’s flexible cloud platform, in a shared virtual server environment located in Tokyo. Honda welcomed the versatility of SoftLayer for building and rolling out the Watson Content Analytics environment for users in the company’s Big Data Initiative team, and its ability to scale.

“For the perspective of our line-of-business users, it was not important whether we ran Watson Content Analytics on premise or in the cloud,” says Kyoka Nakagawa. “What really mattered to them was the speed of implementation – and SoftLayer enabled us to get the solution up and running much more quickly than would have been possible with an on-premise solution.

“In addition, the computational requirements for text-mining with Watson Content Analytics depend on how much content we provide into the custom dictionary.

“Since we are constantly developing our dictionary while we refine our text-mining capabilities, it is vital to have a flexible cloud environment.”

The scalability of SoftLayer also means that it is easy to add new users, so if other departments decide to adopt IBM Watson Content Analytics in the future, Honda will be able to support them seamlessly.

IBM Predictive Maintenance and Quality is designed to help organizations monitor their assets and processes and predict asset failure or quality issues. Honda R&D has been piloting this technology in market quality warranty analysis, and the initial results are promising.

“We have been very impressed with the visualization capabilities of IBM Predictive Maintenance and Quality,” says Kyoka Nakagawa.

“PMQ serves as an analytics development environment to enable our researchers to explore where analytic insights can help identify quality or manufacturing asset issues in a sandbox environment. PMQ also serves as a complete analytics solution that operationalizes analytics with continuous process event data ingestion from our operations, where we can upload data and view it easily in intuitive dashboards.”

Building a big data analytics culture

Honda R&D’s training programs for big data analytics have made a big contribution to creating a more open and collaborative culture among the company’s engineering teams.

“I call it the ‘Big Data Friends Club’,” says Kyoka Nakagawa. “Bringing our engineers together has been a benefit in itself, because they are more likely to share their data and learn from each other. For example, our chassis team was working on a project to study deterioration in exhaust pipes, and they needed some data about gasoline. Through the Big Data Friends Club, they discovered that our fuel economy team already had the data they needed – so it saved a lot of effort and expense.”

She adds: “Learning about big data analytics has also helped some of our engineers think outside the box. Instead of simply analyzing the parameters that they think are important, they can use data mining techniques to uncover patterns and clues that they might never have thought about.

“For example, we have millions of customers around the world, and driving habits in different countries differ in ways that are not always easy to predict.”
“Recently, we were discussing where to locate an ‘engine start’ button in our vehicles. From analyzing the NHTSA records, we found that several drivers in the US had complained that they had accidentally pressed the engine start button with their knees.

“This was a big surprise for us, because it is only possible if you put the car into cruise control, take your feet off the pedals, and fold your legs up on the seat. We had never imagined that people would actually choose to drive like this – so it was a valuable insight for our product design teams.”

Another important advantage of Honda R&D’s approach is that it has shown the company’s engineers the value of big data analytics in understanding how cars and drivers behave in real-world conditions, and identifying new engineering projects.

For example, the company is using vehicle sensor data to monitor drivers’ steering manoeuvres and gain a better understanding of customers’ preferences. This real-world insight feeds into engineering projects that aim to design a steering experience that can be personalized for each driver.

Kyoka Nakagawa concludes: “IBM Analytics is helping Honda R&D’s engineers harness big data to explore valuable new areas of research – and ultimately design better, smarter, safer automobiles.”

Take the next step
To learn more about Honda’s groundbreaking automotive research, please visit www.hondarand.jp

IBM Analytics offers one of the world’s deepest and broadest analytics platforms, domain and industry solutions that deliver new value to businesses, governments and individuals. For more information about how IBM Analytics helps to transform industries and professions with data, visit ibm.com/analytics. Follow us on Twitter at @IBMAnalytics, on our blog at ibmbigdatahub.com and join the conversation #IBMAnalytics.

Connect with us