UNLEASHING THE VALUE OF TELEMATICS IN MANUFACTURING

OPTIMIZE PERFORMANCE AND SUPPORT AND ENABLE NEW PRODUCTS AND SERVICES

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EXECUTIVE SUMMARY

Combining sensor data and traditional enterprise information for big data analytics can give manufacturers a deeper, richer look at how their products are used and how they actually perform once they leave the factory floor.

With the unique market proposition of Teradata, manufacturers can confidently build a business case and go to market faster with a more comprehensive telematics data management strategy, deliver on promised business value, and improve insights for deeper competitive advantage by increasing efficiency, optimizing service and support, addressing warranty issues, boosting customer satisfaction, improving product quality and design, and even creating entirely new products and services.

NEW DATA SOURCES AND TECHNOLOGY

With some 90 percent of the world's data having been generated in the past two years, and billions of sensors embedded already in equipment, machines, and other devices, anywhere from $2.7 trillion to $8.9 trillion in new business opportunities are projected to be generated, according to estimates from IDC and others.

Fueled by the ability to capture this new data, manufacturers are increasingly gaining competitive advantage through streamlined processes, improved product performance and design, better customer understanding, reduced costs, and faster, more accurate business decisions in an ever-expanding set of use cases. But that's only the first step.

Add cloud computing's creation of new information-based products and the mobile revolution's ability to deliver information anywhere at anytime, and you open the door for manufacturers to improve productivity and create new information-based services and revenue streams. In addition to using these new data sources for internal decision making, new technology offers the promise of manufacturers being able to monetize the data they collect.

Too often, however, manufacturers remain unsure of where to start the process to capture, analyze, and augment the vast quantities of the telematics information potentially available. While the promise is great, efforts are oftentimes limited to isolated projects, and industry leaders are still searching for empirical evidence for the return on investment.

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Every major piece of remote or mobile equipment and capital asset—including aircraft, automobiles, engines, heavy equipment, wind turbines, oil rigs, ships, tractors, and so on—increasingly logs a wide array of sensor data.

HOW TELEMATICS WORKS

In what is perhaps the biggest technological revolution of our time, billions of sensors in a variety of locations are now creating and collecting vast amounts of data. Every major piece of remote or mobile equipment and capital asset is embedded with increasing numbers of a wide array of sensors that deliver raw data or computed measures that are used to provide analytics insight for faster, smarter decisions. The information ranges from the obvious—such as diagnostic codes and hours of use—to the more esoteric, including tilt, force, strain, or vibration.

With their ability to constantly monitor and measure practically anything, sensors provide a robust set of new data that can be analyzed for a variety of new and existing business uses.

Telematics is the *transmission* of this data from the devices and sensors to a database where it can be integrated with other enterprise data and analyzed—in some cases in real time. In many applications, an alert is triggered if the data falls outside established parameters (too hot, too cold, spinning too much, etc.).
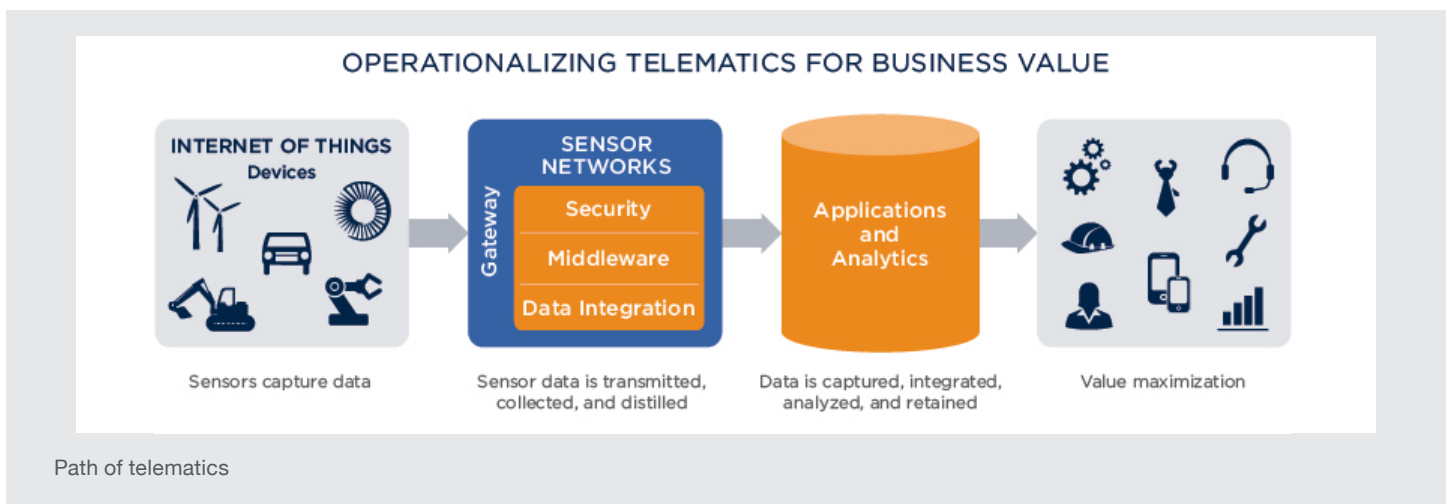
The real challenge lies in figuring out what should be done with the data, in understanding which data is most valuable, and in unlocking that strategic value to gain market share, create new revenue streams, smooth out annual revenue, and reduce customer attrition.

More specifically, this new data allows manufacturers to create new telematics-driven products and services that create competitive differentiation and deeper customer relationships.

USE CASES

Telematics data can be leveraged to address a wide variety of ongoing business challenges, particularly for distributed, remote, or mobile equipment. When integrated with other enterprise data, telematics data provides insight into such critical functions as quality and warranty issues, inventory management, aftermarket sales and operations, customer service, marketing, maintenance, and product life cycle management (PLM). Examples include measuring

~ Equipment utilization, event monitoring, and problem severity analysis to comply with lease terms, warranty conditions, and maintenance requirements

~ As-built versus as-maintained performance

~ Failure rates for early warning indicators

~ Service requirements to notify dealers or customers

~ Service contract performance to confirm whether service is, or is not, completed at required levels

OPERATIONALIZING TELEMATICS FOR BUSINESS VALUE

INTERNET OF THINGS
Devices

Gateway

SENSOR NETWORKS

Security

Middleware

Data Integration

Applications and Analytics

Sensors capture data

Sensor data is transmitted, collected, and distilled

Data is captured, integrated, analyzed, and retained

Value maximization

Path of telematics

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Reduced unplanned downtime

The initial *killer app* for telematics is predictive failure analysis—tracking early warning indicators to detect potential failures before they occur. Organizations that rely on equipment and industrial systems simply can't afford for big-ticket equipment to be out of service for unscheduled maintenance.

Drilling and mining companies, for example, need to know that the drill bit is likely to break before it is a half mile down the well. Closer to home, nobody wants to be a passenger on an airliner that needs unscheduled maintenance. By analyzing the combination of events that converge to create product failures, manufacturers can better predict when a component or piece of equipment might fail, allowing for close inspection and repair *before* the actual failure occurs.

Increased efficiency

Knowing of problems in advance can shorten repair time by helping manufacturers ensure the right parts and resources are on hand in the right location when equipment is most likely to fail—to move from scheduled maintenance to *condition-based maintenance* (CBM). Today, most maintenance is based on rules and cycles. CBM lowers maintenance costs by helping to show how usage and environment impact an object's condition. Instead of rigidly following a calendar-based maintenance cycle, for example, CBM triggers maintenance actions based on sensor alerts in near real time.

CBM applications analyze telematics data to determine how the parametric conditions under which equipment and machinery are operated affect when maintenance is required. For example, when maintenance organizations realize that actual usage conditions of equipment varies from what is anticipated, they can make the appropriate resources, parts, and expertise available when and where they are needed. Because parametric measures are received directly from the equipment, CBM can be far more accurate and cost effective than the typical, familiar static measurements, such as distance (e.g., miles driven/flown) or time frames (e.g., months of service or hours of usage).

Reduced costs

Telematics can give manufacturers faster and more specific understanding of recurring issues and optimal usage conditions of customers' equipment to provide more reliable aftermarket services. For example, manufacturers can use sensor data to reduce costs and improve the warranty process through

~ Root-cause analysis to isolate persistent issues

~ Recall analysis to precisely identify equipment that should be recalled

~ Aftermarket-parts demand based on actual and predicted failure rates

~ Reliability analysis by machine, component, supplier, location, etc.

~ Warranty reserve forecasting improvements for aftermarket services

These calculations represent a signficant bottom-line issue; a 10 percent improvement can translate into millions of dollars in savings. Telematics plays a key role in these transformational business scenarios, including improved productivity and product performance and quality, not to mention customer satisfaction.

New revenue streams

Most important in the long term, manufacturers have an ability to create new information-based revenue streams through data-driven products and services. Integrating use, condition, and performance data from equipment sensors, manufacturers can transform their internal data into an external product or service to generate top line results, much the same way that data is monetized in other industries with credit scores, market and demographic data, and even change-of-address data.

For example, carmakers can provide performance, maintenance, and use history of used automobiles and better understand how to value a used car during the buying or selling process. Equipment manufacturers can provide detailed driver behavior data to fleet managers to better identify training needs or monitor fuel usage.

Companies that take the initiative to monetize their data receive a number of transformational advantages by

~ Creating competitive advantage for their products and services

~ Gaining advantage in competitive new business situations and during final price negotiations

~ Building a progressive market reputation

~ Forging tighter bonds with their customers

~ Establishing new and broader customer connections and relationships

~ Engaging with clients at a more strategic level

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A DEEPER LOOK

Looking in depth, fleet management organizations, for example, represent a compelling use case for telematics by automating and improving a complex and expensive process. With detailed data, fleet managers gain the ability to track driving habits and can correlate that information with geospatial and climate data to better analyze failure and repair trends. Fleet managers use telematics to

1. Receive automatic notifications of potential part failures for a particular vehicle.

2. Correlate the notice with the vehicle's GPS.

3. Identify the closest service center on the route.

4. Automatically contact that service center and make a service appointment while verifying the right replacement part is in stock and potentily order the part if necessary.

5. Inform the driver of the problem and the solution, and provide driving directions to the service center—all while the vehicle is in use.

Similarly, automakers can use telematics information to impact design by truly understanding critical questions such as whether parts are more likely to fail at high speeds in the Phoenix heat, or in Bay Area bumper-to-bumper traffic, for example. Carmakers can also correlate driving habits with repairs to determine warranty coverage. If brakes wear out when taking a passenger car off road, for instance, that might not be a warranty issue.

Understanding patterns of actual use and expected wear in multiple environments helps manufacturers plan for warranty repairs and even drive supplier and product development and engineering decisions to proactively fix problems as they arise. The goal is to use equipment and failure data to prioritize changes for the biggest, fastest return on investment.

Most dramatically, telematics promises to improve the customer experience. The auto industry, for example, is combining data from in-car sensors with manufacturing, quality, dealer, and customer data to measure overall customer happiness and optimize repair cycles.

If the automaker can predict that a vehicle is going to need service soon, it can combine that effort with a scheduled service visit to save its customers time and hassle. Along with better products and services, that kind of data-driven thoughtfulness can increase customer loyalty and repeat purchases essential to a carmaker's long-term profitability.

GROWING PAINS

Despite the promise of first-market mover advantage, telematics adoption remains in the adolescent stage as the industry struggles to quantify its value. Leaders in the industry are embracing the use of telematics and sensors to improve processes but are still searching for empirical evidence of its return on investment.

The biggest issue may be that telematics data is often still confined to a few isolated projects, controlled experiments, and proofs of concept within the company and not integrated with other enterprise data and processes. That approach limits its usefulness and forces companies to justify the return on each incremental investment instead of seeking the transformational change that could come with wider enterprise adoption.

PUTTING TELEMATICS DATA TO WORK

The following are some considerations when creating new telematics-based products and services:

~ What commercial offers for customers can be developed from existing data?

~ What basic information-based services are provided to all customers? What additional information and insights should be made available for an additional fee?

~ What gaps currently exist in your data, and how do you acquire missing information?

~ What is needed to keep up with, or leapfrog, the competition?

~ What new or emerging data sources would provide a distinct advantage?

~ What are the delivery requirements for information, and does your existing technology support those requirements?

~ How are the fees structured for new data services? Subscription, one-time fee, or other?

~ What customers would be early adopters of your new services?

~ How big of an opportunity could telematics become?

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Not surprisingly, companies then find themselves stuck as they try to scale up to use the newfound insights more widely. Rather than a fragmented approach, an enterprise strategy is required to create the infrastructure necessary to cope with the flood of data created by telematics-based products and services. Limited sharing of data across the organization is one reason many manufacturers have been collecting data for years but still don't fully analyze or use it, creating so called *dark data*.

Further, as manufacturers extend the use of telematics when developing a data-monetization strategy and defining the delivery model, they must ensure that the technology backbone contains accurate, reliable, granular data and is able to perform the predictive analysis and required reporting to accommodate a large number of users in real time.

Strategies for using telematics data are evolving as companies identify the business need and investments required, including whether to use this data as a competitive differentiator or as a check-the-box activity that will be required at some future time.

TELEMATICS FOR MANUFACTURERS

Manufacturers are realizing that how they use and exploit data is key to their ability to innovate. Creating new business capabilities faster and better than competitors is how companies will win going forward.

Teradata delivers unique business value for telematics data, built on a foundation of integrated, granular data within a single framework. Teradata makes data accessible to business decision makers across an enterprise, resulting in reduced time to market and increased visibility to operational and business transactions.

Teradata possesses unmatched expertise in enabling data-driven businesses, helping companies exploit *all* their data in ways that enable innovation and create competitive advantage. The unique foundation of the Teradata® solution helps manufacturers store, integrate, and analyze telematics data with traditional structured and unstructured enterprise data—from social media, customer relationship management (CRM) and enterprise resource planning (ERP) systems, to production, repair, and operational—from all areas of the company. The combination delivers enterprise-wide insights for better business, customer service, and engineering decision making.

ENTERPRISE DATA TYPES THAT TERADATA INTEGRATES WITH TELEMATICS DATA

~ Manufacturing data
~ Service contracts and history
~ Product and performance history
~ Warranty and quality data
~ Maintenance logs and history
~ Lease management data
~ Dealer and supplier data
~ Profitability measures, forecasts, and finance data
~ CRM data

Data exposes insights. Insights permit action. And action results in new and innovative business capabilities. Teradata enables this value chain by empowering back-office *and* front-line workers with direct access to near-real-time enterprise data. By combining interactions (enabled by big data technologies) with transactions, Teradata customers are experiencing 10 percent to 25 percent greater insights, and leveraging those insights to drive innovation.

Technically speaking, Teradata supplies the framework for data integration and management, with the capability to handle and scale to extreme data volumes and deliver actionable information throughout the organization.

Additionally, the Teradata approach allows in-database analytics to mine vast amounts of information and can give customers real-time, direct access to the data. Teradata provides a unique ability to correlate telematics data with enterprise customer information to reveal a clearer, more complete picture of how customers actually use products and how those products perform.

Just as the data comes from all parts of the company, a Teradata analysis serves all parts of the company, including marketing, customer service, sales, engineering and design, manufacturing, quality, procurement, and so on. The end result is to bring manufacturers closer to their customers.

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> The Teradata *special sauce* is correlating telematics data with enterprise customer-information data to reveal a clearer, more complete picture of how customers actually use products and how those products perform.

INSIDE THE TERADATA SOLUTION

The Teradata telematics solution consists of three components that comprise the Teradata Unified Data Architecture™. Each component can be used independently or with the others. Either way, data, answer sets, and insights can be passed seamlessly among each element of the architecture:

~ Teradata integrated data warehouse—This leading platform for strategic and operational analytics provides a single source of centralized data for reuse. The integrated data warehouse combines telematics data with all the other data the company has collected.

~ Teradata Aster® SQL-MapReduce®—This component handles data discovery and pattern recognition. Its discovery analytics unlock insights from big data collections using a variety of prepackaged analytics techniques accessible by business analysts, not just specialized data scientists. By bringing data discovery closer to the business, Teradata makes it easier to iterate quickly, to rapidly identify the business value in the massive amounts of data.

~ Apache™ Hadoop®—This open source database offers effective, affordable technology for data staging and long-term storage in preparation for iterative and trend analysis.

Extending the capabilities of the Teradata Unified Data Architecture™ is a best-of-breed partner ecosystem that provides in-database statistical functions, data acquisition, and integration with most major business intelligence tools. Critically, Teradata consulting experts provide the industry knowledge and services that allow manufacturers to create a solution that precisely meets their requirements. Finally, whatever the starting point, the Teradata Unified Data Architecture™ allows the environment to be flexible to expand to meet the manufacturer's needs.

CONCLUSION

The future of manufacturing will be information enabled. Carefully selected and analyzed information will be delivered in real time at all organizational levels to support ongoing processes and create a global virtual unified view of products, processes, and capabilities.

Strategic advantage will be based on how well a manufacturer transforms its data into actionable information to innovate, either internally or externally. Information-based services will be created and expanded to create new revenue streams.

Further transformational gains are possible as manufacturers advance the collection, integration, access, distribution, and exploration of the information available to them.

Sensors, telematics, and enterprise information promise significant competitive advantages to manufacturers that learn to leverage them. But capturing the data from all those sensors and meters is the easy part. Real strategic advantage stems from how quickly and effectively manufacturers can integrate and analyze that data to drive efficiency and innovation to reduce costs, improve productivity, delight customers, and increase revenue.

Teradata products and services provide manufacturers with the essential foundation to manage and analyze telematics data—combined with traditional enterprise data—to do everything from lower costs to boost customer retention to create new revenue streams.

To learn more about telematics and the Teradata Unified Data Architecture™, visit **www.teradata.com/products-and-services/unified-data-architecture/**, where you can get more information about the integrated data warehouse, Teradata Aster Discovery Platform, and Hadoop—and access a wide variety of resources.