The Connected Insurer

Modernizing Insurance Using Analytics Solutions Built to Harness the Internet of Things

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Contents

Turning the Internet of Things Into a Sustainable Business Model for Insurance

While the insurance industry has a reputation for being static and slow to change, it has experienced significant disruption and innovation over the past five years. For example, insurers have made major investments in digital initiatives as they seek to innovate customer and distribution relationships. At the same time, a pioneering "InsurTech" sector has emerged, exploiting digital opportunities to sometimes complement – and sometimes compete with – the traditional insurance sector.

But the most dramatic changes to the insurance industry have resulted from the internet of things (IoT). IoT refers to connected devices that can transmit data using technologies such as Wi-Fi and Bluetooth. These devices includes "things" like wearable devices, sensors in household appliances and connected vehicles. Analysts predict there will 21 billion IoT sensors installed by 2020 – and we're already seeing how this technology is dramatically changing our world today.[1]

As explored in this paper, the IoT has the potential to radically disrupt the traditional insurance business model and modernize traditional processes, especially in how the sector assesses risks. For many insurance lines of business, IoT can enable more accurate risk assessments, which can substantially reduce losses and transform the nature of the relationship with policyholders.

However, with a few exceptions, the insurance sector is still at an experimental level of implementation with IoT. Use is generally limited to a small number of product initiatives or a small subsection of the customer base. These limited initiatives have been important in enabling insurers to safely assess the impact of IoT and to understand new rating techniques based on IoT data.

But adoption will accelerate, thanks to advancements in big data analytics solutions that can extract insights from massive, streaming data sources. By using data exploration and analytics, insurers can, for example, rank and weigh hundreds of new variables to develop highly accurate risk and pricing models based on IOT data.

For these reasons, a growing number of insurance firms are now looking to scale operations and expand their volume of IoT-based business. Given the nature and volumes of the data involved, this will have significant implications for insurance operations and data architecture. This white paper explores the opportunities IoT creates, the barriers to its adoption within the insurance industry, and what's needed to fully exploit the potential of IoT for competitive advantage and growth.

[1] http://www.informationweek.com/mobile/mobile-devices/gartner-21-billion-iot-devices-to-invade-by-2020/d/d-id/1323081

IoT Opportunities Abound for Insurers

IoT offers significant opportunities for the insurance sector. For example, many insurance lines, such as automobile insurance, have become largely commoditized in recent years with downward pressure on premiums. IoT offers the potential to offer radically different products with new granular pricing mechanisms and value-added services, such as driver feedback for auto insurance customers or maintenance alerts for home insurance customers. These value-added services can be used to differentiate one firm over another; create closer, more proactive relationships with policyholders; and support potential new sources of revenue.

These advantages can affect all parts of an insurance organization. For actuaries and underwriting, for example, IoT can provide new data to more accurately assess and price the risk. For claims departments, IoT can make it possible to automate loss notification based on sensor data. And for marketing executives, IoT can provide unprecedented insights into customer behavior.

Let's take a closer look at how IoT can benefit different kinds of insurance firms.

Life and Health Insurance

The life and health insurance industry is currently facing major disruption due to significant demographic changes. People are becoming healthier and living longer, which is changing risk profiles at different ages. At the same time, wearable devices such as Fitbit, Garmin and Apple Watch® are ushering in a new era in wellness. These devices are able to track sleep patterns and activity levels, heart rates and even blood sugar levels. This highly personal data is extremely valuable to underwriters, as it can help them identify the most appropriate insurance rates for their customers. Insurers can also use this data to offer incentives to policyholders who can show that they exercise regularly; by transmitting IoT data from wearables, customers can make the tracking process even more transparent, accurate and current.

Auto Insurance

With the adoption of usage-based insurance (UBI) over traditional pricing models, the first round of business model disruption has already taken place within the auto insurance industry. With UBI, either in-car sensors or a smartphone app are used to monitor driver behavior and track when, where and how a vehicle is in motion. The insurance premium is primarily determined on the basis of driving behavior, rather than proxy variables.

Claims processing is likely to be the next area of focus for IoT investment. Imagine companies having automated notifications from telematics sensors[2] that indicate that a collision has taken place, along with data on the exact location and impact speed, and if the driver was using an aggressive driving style that is not consistent with historical data on the usual driver; this may suggest that the vehicle was stolen. Access to this kind of information in a timely manner can help carriers respond appropriately to accidents or potential theft. Telematics is expected to eventually play a role in enabling self-driving car auto insurance.

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[2] Telematics refers to the integrated use of telecommunications and informatics in vehicles. Examples include GPS navigation systems and vehicle tracking systems.

Property Insurance

The property insurance industry will see an increased adoption of IoT over the next 10 years. Homes, offices, commercial buildings and industrial installations will be fitted with sensors and devices that generate real-time data on assets and trigger alerts on everything from overheating malfunctions and issues regarding building material strength to water leakages and breakdowns. These alerts ensure events – both emergent and gradual – are immediately recognized and addressed swiftly, minimizing damage and thus claim costs.

Real-time monitoring can be harnessed by insurers to provide proactive maintenance services to property customers, and thus become a new source of revenue. Even home, office and industrial equipment can be remotely monitored for ongoing situational assessments. Any measured factor leading to malfunction or damage can trigger notifications to repair shops or manufacturers for prioritized service.

Technical Challenges:
IoT and the Big Data Explosion

As the prior discussion suggests, the potential benefits of IoT for insurance companies are real and significant. And technologically, good progress has been made toward enabling IoT-based solutions; for example, the widespread deployment of asset sensors, which were first introduced several decades ago, lay the foundation for the IoT. But in the last five years, two major changes have led to the IoT market maturing: 1) the size and cost of sensor devices have decreased dramatically, and 2) new Wi-Fi and wireless communications have made it more efficient to transmit large volumes of data.

If the current trends continue, analysts expect that within 10 years, IoT will become pervasive, as sensors will be embedded into most of the vehicles, buildings, appliances and wearable devices that a typical household uses. It's likely that a typical household will have over 100 connected devices, resulting in an explosion of data. This wealth of "new" data has the potential to drive better decision making across many industries, and in particular the insurance industry.

However, there are challenges to managing this data. For example, consider the amount of data automotive telematics devices can generate. Every second, a telematics device will produce a data record. This data record will include information such as date, time, speed, location, acceleration or deceleration, cumulative mileage and fuel consumption. Dependent on the frequency and length of these trips, these data records or data sets can represent approximately 5MB to 10MB of data annually, per customer. With a customer base of 100,000 vehicles, this represents more than 1 terabyte of data per year. So insurers will need to fully and efficiently analyze these huge amounts of data, often in real time – otherwise, what's the point of collecting it in the first place?

Further, given the huge amount of new data that will be available through IoT, insurers will be challenged to determine which data can yield predictive insights and is related

to risk ratings. For example, an insurer may want to know which data variables can forecast driving behavior, failing water pipes or healthier living that reduces the risk of death. This requires being able to filter the data "noise" from the signals that accurately indicates a risk.

In addition, adding a new variable increases the number of data points and relationships exponentially, making it difficult to find meaningful relationships in data. To illustrate, consider a simple example: if you are testing for relationships among any five variables, there are 10 two-way tests to run, shown in the equation $(5\times4)/2 =10$. If the number of variables doubles to 10, you more than quadruple the number of relationships to test, as shown in the equation $(10\times9)/2 = 45$. This one change dramatically increases the number of tests to run. Given that IoT sensors are adding dozens, if not hundreds, of new variables, companies will need to potentially analyze millions of relationships! Complicating matters further, many of those relationships may be redundant or trivial. How can insurers quickly and accurately find the "real nuggets," or "signals" hidden among them?

Business Challenges of IoT: Embracing Change

New opportunities and technologies often present challenges and changes to the established business model and processes used within an industry. And insurance is no exception. Companies will need to embrace the changes IoT brings in order to realize its benefits.

Disruptions to Existing Insurance Business Models

New technologies like IoT can help insurers mitigate risks and reduce claims. However, the competitive nature of the insurance industry means that a reduction in losses will tend to result in lower premiums over time – and shrinking revenue is never a good trend for any industry. So in order for IoT to be fully embraced, companies will need to identify new sources of revenue growth and invest strategically in these areas.

At the same time, insurers should expect to encounter new competitors who are already using IoT, including auto manufacturers and home security companies as well as digital firms such Google and Amazon. These companies will be in a strong position to use the information they are collecting to offer or distribute new, IoT-based insurance propositions and effectively own the relationship with the customer.

Finally, IoT is being marketed as a way to provide discounts for individuals who are safe drivers or exhibit healthy lifestyles. But unless IoT can be used to change behavior across a whole population, individuals or businesses identified as a "bad risk" using new technologies will tend to be more heavily penalized than if they were customers of companies employing traditional insurance models. This may cause a backlash amongst the general public and hinder the growth of insurance products linked to IoT.

Data Utilization for Business Decision Making

The insurance industry has always been data-centric, as companies have long relied on historical data from policy administration solutions, claims management applications and billing systems to make informed decisions about risks, customers and more. But what's changed recently is the availability of massive volumes of new data from sensors and other sources; this influx is turning the insurance business model on its head. Winners will be able to process this explosion of data in a timely manner to make the right business decisions.

Unfortunately, many insurance companies today still struggle to process and analyze smaller, traditional data volumes. To meet the challenges of analyzing large data volumes generated by IoT, insurers need an enterprise data management strategy that provides a unified environment for the solutions, tools, methodologies and workflows required to manage IoT data as a core asset. It should also be flexible and scalable to reduce the time and effort required to filter, aggregate and structure the exponential growth in data. This kind of strategy will also help companies merge their new IoT-sourced data with traditional data such as customer and policy records.

Data Ownership

Data created and available through IoT represents a significant fountain of knowledge that enables insurers to better understand risks. But there's an ongoing debate within the industry regarding the question, "Who owns the data?" Is it the insurance company or the customer? Insurance customers may argue they have rights over the data, given its pervasiveness and intrusiveness into their personal lives. Other car insurance firms may also need access to historical driving data from the existing insurer to price accurately when a customer decides to switch insurers.

Data Regulation

The insurance industry continues to be one of the first economic sectors to be regulated – and it continues to face close scrutiny by public authorities throughout the world. IoT is posing new regulatory challenges – specifically, regarding the best way to regulate the data created by IoT sensors. Regulations already exist to cover data privacy. However, the more personally invasive nature of IoT data will present many new challenges. For example, the insurance company will now know the precise location of a driver at any point in time, while a health insurer will have very accurate information on the health of the insured. This data will need to be very carefully secured and protected. The mobility of IoT data may necessitate additional regulation of cross-border data – for example, when a driver travels to another country.

Data Security and Fraud

As IoT-enabled devices and technologies are adopted more broadly, expect to see increases in cyberattacks and fraudulent activities. This should come as no surprise given the vast amount of data flowing between a connected vehicle, a connected home, and the insurance company insuring these assets; this data is potentially vulnerable to interception and can be used to perpetrate new types of application and claims fraud. To protect against these activities, insurers will need to invest more heavily in data security and fraud systems.

Exploiting IoT: How Can SAS Help?

IoT will change every part of the insurance value chain. It will open many opportunities for how insurers interact with their customers as well as the products sold and services provided. But simply collecting data from connected sensors, systems or products is not enough. Insurers need more flexibility regarding where, when and how to manage and analyze IoT data. They also need IoT solutions to operate at enterprise levels of scale.

SAS can help. We offer the widest and deepest range of analytics capabilities to analyze the growing volumes and high velocity of data generated by sensors and devices. These capabilities are built on the long-standing reputation of SAS in data management and advanced analytics, as well as the experience SAS brings from other industry sectors that are already operating at scale with IoT.

SAS provides a comprehensive solution – SAS® Analytics for IoT – that supports the IoT analytics life cycle, enabling companies to transact and exploit IoT data at scale and run it in conjunction with their existing data infrastructure.

Figure 2 shows the flow of IoT data in the IoT analytics life cycle and how it interoperates with traditional data sources. Given the diverse nature and volumes of IoT data, this data first needs to be intelligently filtered to extract relevant data, which can then be merged with existing data sources (for example, combining IoT-sourced driving data with existing customer profile data). IoT and traditional data can then be used to create powerful analytical models; if appropriate, these models can be deployed in stream against IoT data in motion. This enables appropriate decisions to be taken or alerts to be issued quickly and responsively based on this analysis.
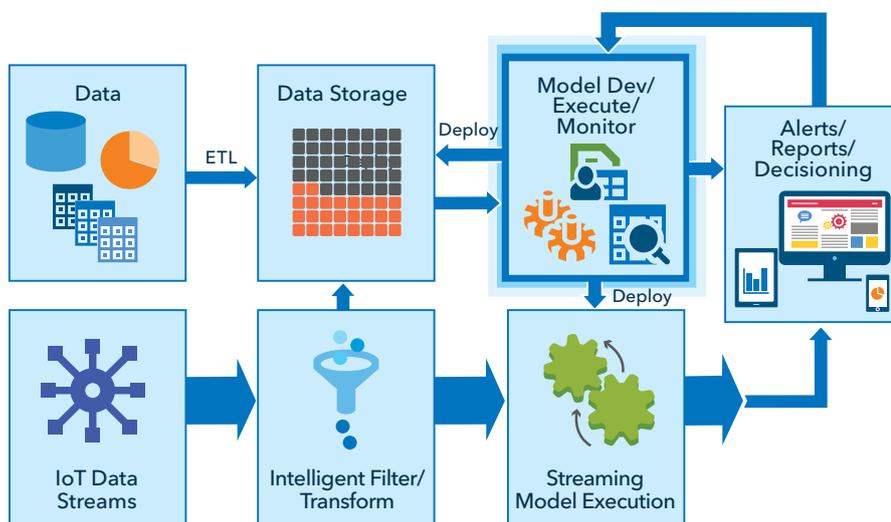

Figure 2: Internet of Things Analytics Life Cycle

Let's take a closer look at some of SAS' IoT-enabling technologies.

SAS® Data Loader for Hadoop

To take full advantage of analytics, companies must be able to analyze all relevant data. This can be a challenge, given the large number of disparate data sources and informational silos that organizations develop. New data sources must be integrated with existing repositories in a consistent and unified way. To cope with these growing volumes of data, many organizations are using Hadoop. But if data cannot be accessed efficiently, it has no more value than if that data had not been collected in the first place.

SAS Data Loader for Hadoop helps insurance companies access, manage and fully exploit data on Hadoop efficiently through an intuitive user interface. For example, this interface enables business users to work with data on Hadoop without depending on skilled IT resources.

SAS® Event Stream Processing

Insurance companies are investing heavily in capabilities for capturing and storing as much data as possible, but the key challenge is using this data while it is still in motion. As the velocity of information increases, so is the speed with which insurers must react when managing the data. The majority of IoT data stream content is generally not useful, making it essential that companies be able to quickly filter the data to determine what data is relevant to their needs.

To maximize the value of streaming data from sensors and devices, SAS Event Stream Processing analyzes and understands millions of events per second, detecting patterns and anomalies as they occur. The analysis shows the correct actions to take, what alerts to issue, which data to store and which data elements to ignore.

SAS® High-Performance Analytics

Not all insurance IoT initiatives are dependent on analyzing data as it streams and making real-time business decisions. Many insurance organizations prefer to review and analyze the data at rest and in aggregation at the end of specified time periods.

With SAS High-Performance Analytics, insurance companies can develop and process predictive models that use huge amounts of diverse data. Using a highly scalable, distributed in-memory architecture, data scientists and actuaries can derive more accurate insights when assessing risk, scoring behavior and pricing insurance products based on IOT and other data.

SAS® Data Management

A sound data management strategy is essential for IoT processing, as it enables the platform to operate efficiently and effectively at scale. SAS Data Management enables this with four key capabilities:

- Data integration – to improve the flow of accurate telematics information across the organization.
- Data quality – to ensure information integrity by managing the data quality life cycle.
- Enterprise data access – to manage the access and use of telematics data across the enterprise.
- Master data management – to create a single, accurate and unified view of all telematics data.

Capitalize on the Opportunity With SAS®

While the full potential of IoT for the insurance industry may not be realized for many years, early applications are already producing positive results for companies. IoT will undoubtedly make losses easier to predict and prevent and become mainstream technologies within the industry. Furthermore, as smart home devices and wearables proliferate and driverless cars are adopted more widely, IoT will facilitate a shift toward a new type of customer relationship; insurance will become less about protection and reaction to a loss and be more about providing proactive, prevention services for its customers.

However, IoT technology and sensors alone will not change the insurance industry. Companies must be able to fully and efficiently analyze IoT data in order to make real-time business decisions that produce radical breakthroughs. This will require investment in innovations such as in-memory computing, massively distributed processing frameworks and event stream processing that unlocks the value of connected devices. It will also require the support of a solution provider who understands how to make this technology work at enterprise levels of scale.

Change is inevitable for any industry. The impact of IoT applications is just beginning, and the winners will be the insurance organizations that embrace the changes IoT brings and capitalize on uncertainty.

To learn more about how SAS can help, visit sas.com/en_us/industry/insurance.html.

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