The Internet of Things (IoT) is one emerging technology trend that is impacting and possibly transforming almost all industries segments.

Adding connectivity and intelligence to everyday objects, coupling it with near real-time analytics powered by cloud infrastructure is the primary characteristic of IoT. Smart connected “products” are becoming the field of play for competitive forces that can disrupt any established industry.

**THE INTERNET OF THINGS**

IoT is not exactly a fundamentally new technology; it is a potential synergy arising out of several existing technologies coming together to form a bridge between the physical and the digital. IoT drives enterprises’ information and decision support systems through real-time physical-world data, thereby removing any gaps between planned and actual situations. In other words, IoT drives enterprises to become real-time enterprises.

Value creation through IoT arises from its three key characteristics:

1. It provides continuous information about the internal state and operational environment of any product, system, premises in which it is incorporated.

2. It brings the ability to overlay information about emerging situation (trending data) with pre-defined models based on historic data. For example, in usage-based auto insurance, using car telematics, it gets information about the actual driving patterns of a specific driver in particular situations which can modulate risk models built on historic and aggregate data. This situational awareness and intelligence is a fundamental value created by IoT.

3. Finally, it brings the possibility of closing the feedback loop by taking, recommending or nudging towards desirable actions.

Supervisory Control and Data Acquisition (SCADA)-based industrial control systems, M2M communication systems, active RFID-based asset tracking systems, GPS-based fleet tracking systems precede IoT and are subsumed by it now. IoT differs in a fundamental way from those systems in that it clearly separates data acquisition and aggregation regimes from sensor data storage, manipulation and distribution or consumption regimes, thereby “horizontalizing” the earlier vertically integrated closed systems.

---

*Security and privacy concerns are the biggest hurdles for large scale IoT deployments*
This is a fundamental shift since sensor data acquired by different entities for specific purposes can be shared, monetized and utilized by completely independent entities for their own purposes. For example, insurers and their catastrophe modelers and underwriters can leverage sensor data gathered by utilities, building/industrial automation systems etc., just like they do now, with long term weather, geological and demographic data to model/price risks and exposures from hazards.

Security and privacy concerns are the biggest hurdles for large scale IoT deployments. Other issues that need to be addressed for pervasive deployment of IoT are the lack of common standards for connectivity protocols and data interchange.

**Mindtree Virtual Sensor Gateway Model**

Often, sensor data acquisition and aggregation networks operate as islands even within the same deployment premises, thereby denying the benefits of true situational intelligence. For example, a connected home may subscribe to multiple service providers for utility monitoring and metering, home automation and control, security and surveillance, infotainment and finally, remote health monitoring services. Each service provider may own and operate devices installed within the premises for their specific purposes. However, in the eventuality of an emergency (such as a possible heart attack), the health care provider can only monitor vital parameters but not have any clue as to the ambient temperature, ventilation status etc. This can severely impede the effectiveness of emergency assistance, even though the means to and even rights to access ambient sensor data resides with the end user!

Similar situations of islands of sensor networks can easily be visualized in the context of a cold chain transport truck. Here, the ECU data is part of the truck OEM’s network, the cabin infotainment network is owned by the fleet operator and the temperature and other parameters within the container is owned by the cold chain company. In a potential breakdown situation, these islands do not work together, but depend entirely on manual stitching together by the driver and fleet operator staff!

Our approach is to help realize the fullest potential of IoT by facilitating smooth interchange of sensor data across ownership regimes and across data aggregators and consumers. To realize this, we have a **Virtual Sensor Gateway Model** that elevates sensor data to first class object, thereby augmenting basic sensor data with several attributes and meta-data and even the notion of quality of sensor data.

For example, sensor data can be tagged based on mutual trust and authenticity relationships as primary or contextual data, detailed or summary data, bridging data acquisition frequency and accuracy needs of the consumer and data acquirer through sensor data fusion. We achieve these objectives through a virtual sensor gateway model with well-defined service interfaces.

**IoT AND THE INSURANCE INDUSTRY**

From an insurance industry perspective, IoT can be leveraged in almost all lines of insurance such as property, casualty, life and health, in varying degrees. Telematics-based pay-as-you-drive or usage-based insurance is the first off the block in automotive insurance line.

Applications of IoT in Manufacturing, Supply Chain and Logistics and Retail include asset or merchandise tracking, monitoring of plant and machinery for utilization, faults and preventive maintenance. These, together with monitoring of plants, shop floors, warehouses and premises for safety and security as well as prevention of theft and pilferage will contribute to property, casualty and business loss prevention.

**Early Adoption Of IoT in Insurance**

A 2014 IoT readiness survey by Celent points out that almost all CIOs of insurance carriers are closely watching the impact of IoT on their business. Impact on claims seems to be a definite one but the time horizon for that is not clear. However, impact on pricing and underwriting is yet to be deciphered. Telematics auto insurance appears to be the one exception with usage-based pricing models.

Progressive, a leading car insurance firm in the United States, offers a usage-based insurance program called Progressive Snapshot®. It provides a personalized rate based on the driver’s driving. With more than 1.6 million drivers enrolled in Snapshot, Progressive has collected data on 10 billion miles of travel and driven its bottom line; all this while making roads safer, reducing claims, lowering premiums and building better customer relations.

Several insurance companies including Liberty Mutual, GMAC Insurance, Allstate ALL-0.09%, Progressive PGR-0.49% and Octo Telematics have implemented the usage-based insurance (UBI) model and proven its viability. Every minute, Octo stores over 72,000 data points from drivers around the world. As of this year, the company has collected behavioral information on over 150 billion miles of driving. Unprecedented insights from this data enable insurance providers to offer customers more accurate and flexible pricing options along with solutions designed to improve safety, security, protection and assistance for drivers.

Allianz, Germany’s largest insurance group, has entered into a digital alliance with Deutsche Telekom. Together they plan to offer a solution consisting of technology, assistance services and insurance that will enable customers to monitor their homes using sensors and their smartphones.
If there’s a problem such as a burst water pipe, sensors will automatically inform the user through his or her smartphone as well as alert Allianz’s emergency hotline. If necessary, Allianz will organize repairs and settle the bill.

**BENEFITS AND POSSIBILITIES OF LEVERAGING IoT IN INSURANCE**

IoT will boost the accuracy of data used by insurers for pricing. It can also provide data about other factors that were traditionally not used in pricing (such as customer-specific contextual data). In either case, IoT enables continuous collection of data on status of properties and assets and the operations outside safe limits, durations and inadequate maintenance.

Wearable technologies and smart buildings can be leveraged in risk assessment, loss control and audit services offered to large commercial properties.

While the long term impact of IoT can benefit the entire chain of insurance operations as outlined above, initial low hanging fruits will be in loss control and driving customers towards safer behavior.

The following table captures potential benefits of IoT in the whole range of insurance industry workflow:

<table>
<thead>
<tr>
<th>Product Development &amp; Marketing</th>
<th>Agents &amp; Brokers</th>
<th>Underwriting Dept.</th>
<th>Loss control/Engineering Department</th>
<th>Claims Department</th>
<th>Reinsurance Department</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Improvement Goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase revenue per customer for my products</td>
<td>Improving quality of business</td>
<td>Reduce adverse selection incidences</td>
<td>Improved assessment of proximity cause of loss, chain of cause and intervening causes</td>
<td>Improved accuracy of loss coverage and indemnification</td>
<td>Better estimates of cascading losses</td>
</tr>
<tr>
<td>Reach more customers with less additional effort</td>
<td>Reduce customer churn after claim</td>
<td>Qualified waivers and Estoppel</td>
<td>Minimizing vicarious liability</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IOT Leverage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop innovative products with risk-based pricing in line with the risk exposure leveraging connected data sets with differential pricing</td>
<td>Enable agents with contextual data relevant to the customer (assets list, hazards, liabilities)</td>
<td>Customer-specific context-ual data to lower incurred losses or increase written premium</td>
<td>Targeted proactive inspections</td>
<td>RT/continuous data for evidence and establishing incident causes</td>
<td>Better estimates of cascading losses</td>
</tr>
<tr>
<td>Encourage top-up coverage through cost benefit simulation built into the product or Agent app</td>
<td>Anticipatory and proactive services touch point with the insured, based on data event triggers (ex. New appliance installed)</td>
<td>Detailed data-driven underwriting</td>
<td>Data-backed recommendations to insured</td>
<td>Automate incident reporting and claim request</td>
<td></td>
</tr>
<tr>
<td>Building newer channel partnership (ex. with utilities and equipment companies) with tighter data integration and business models</td>
<td>Post incident risk avoidance awareness program for claimant based on data leading to the incident.</td>
<td></td>
<td>Post-claim fitness certification checks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Remote inspections without onsite presence</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Threats and Challenges for Insurers
The insurance industry will be threatened by new entrants with far more detailed customer insights. For example, Rakuten, Japan’s largest online retailer had bought AIRIO Life Insurance to leverage its vast customer data. Sonera, a Finnish telematics services firm is already offering usage-based insurance and other allied services to its customers.

The primary challenge to insurers in adopting IoT is the dilemma over whether they can at all install their own devices in insured properties and assets or depend on equipment vendors or other service providers. Unlike simple car telematics systems, insurance carriers may lack the expertise to install sensor devices in plants, warehouses and large public infrastructure. Besides, the cost of such devices need to be offset in some way through novel services and value propositions to end users or through innovative business models with third parties.

In the absence of own devices, insurers will have to forge partnerships with equipment vendors (car OEMs, industrial equipment manufacturers, HVAC/Home automation equipment manufacturers), or service providers (telecom, utilities, home automation, health care providers etc.).

Leveraging sensor data from third party providers raises the issue of trustworthiness of data sources. It can limit the potential to leverage such data, for example, in rejecting insurance applications from specific customers or in establishing negligence, proximity cause of loss, chain of cause and intervening causes during claims disputes.

In the absence of authenticity and trustworthiness of data sources, insurance carriers may only be able to nudge customers towards safe behaviors and minimize negligence.

Possibilities
- Android and iOS smart phones are beginning to incorporate SDKs for home automation. Insurers can leverage these SDKs through apps to collect sensor data from installed sensor devices.
- Use mobile apps for data aggregation and risk control-related customer engagement
- Deploy mobile applications and wearables for loss control engineering workforce during site inspection to improve effectiveness and efficiency of loss control inspection activities

- Provide historic and contextual information through wearables. For example, maintenance records, past failure records of machinery, MTBF data for class of asset/property, key parameters to evaluate for specific machinery/equipment etc.
- Automated incident reporting and mobile application for simplified claims filing with pre-loading of relevant data.
- Mobile application for agents with background data from IoT service providers on as-set/risk profile change events.
- Mobile device application for agents to simulate what-if scenario walkthroughs with customers and enable upselling of top-up cover.

HOW CAN MINDTREE HELP
We have end-to-end capabilities, right from Chips to Insights/NBA Chip
- Leverage expertise in connectivity protocols, emerging IoT standards, and sensor/wearable device and platform ecosystem knowledge and expertise
- Integrating cloud-based IoT platforms with sensor data acquisition devices
- Assuring interoperability of devices with gateways and cloud platform
- Customize Mindtree customer products in wearable devices and industrial equipment for tighter integration and value-add through unique features.
- Data evaluation and enhancing sensor data trustworthiness, security and privacy protocols for deployment scenarios for insurers
- Platform tools to annotate and qualify data with risk-related attributes
- Building fusion architectures and platforms to integrate RT sensor data with historic data models
- Multiple views of the same data from the perspectives of different stakeholders (consumer agents, underwriters, engineering department etc.) Business insights/NBA
- Integrated use cases which will enable harnessing of additional data points for:
  - product innovation and pricing
  - Better underwriting and risk management
  - Claims management
- Prototyping innovative applications and validating business value potential, assumed risks and ROI

<table>
<thead>
<tr>
<th>CONTACT MINDTREE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USA</strong></td>
</tr>
<tr>
<td>25 Independence Blvd. suite 401 Warren, NJ 07059 United States</td>
</tr>
<tr>
<td>+1 908 604 8080</td>
</tr>
<tr>
<td><a href="mailto:info@mindtree.com">info@mindtree.com</a></td>
</tr>
<tr>
<td><strong>India</strong></td>
</tr>
<tr>
<td>Global Village, Mysore Road, Bengaluru - 560 059 Karnataka, India</td>
</tr>
<tr>
<td>+91 80 6706 4000</td>
</tr>
<tr>
<td><strong>London</strong></td>
</tr>
<tr>
<td>3 Sheldon Square London, W2 6PR United Kingdom</td>
</tr>
<tr>
<td>+44 (0)203 763 3300</td>
</tr>
<tr>
<td><strong>Australia</strong></td>
</tr>
<tr>
<td>Level 7,155 George St The Rocks NSW 2000 Australia</td>
</tr>
<tr>
<td>+61 2 92912200</td>
</tr>
</tbody>
</table>

ABOUT MINDTREE: Mindtree [NSE: MINDTREE] delivers digital transformation and technology services from ideation to execution, enabling Global 2000 clients to outperform the competition. “Born digital,” Mindtree takes an agile, collaborative approach to creating customized solutions across the digital value chain. At the same time, our deep expertise in infrastructure and applications management helps optimize your IT into a strategic asset. Whether you need to differentiate your company, reinvent business functions or accelerate revenue growth, we can get you there. Visit www.mindtree.com to learn more.