CONNECTING 'THINGS' TO CUSTOMERS

BPM CAN HELP BUSINESSES EXTRACT THE FULL POTENTIAL OF IOT

DECISIONPOINT™ by WNS

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This paper is designed to help stakeholders navigate the landscape of IoT with respect to key processes in niche verticals. It provides an analysis of the processes most impacted by IoT implementations and concludes with an emphasis on the interplay between Business Process Management (BPM) and IoT and why there needs to be a process framework in place to govern and manage IoT implementations.

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EXECUTIVE SUMMARY

The computing world is in the midst of an inflection point with Internet of Things (IoT). Its potential to radically transform technology and human life is yet to be fully understood. It is expected that there will be almost 100 Billion connected IoT devices making a global impact of more than USD 11 Trillion by 2025 (McKinsey Global Institute, 2015).

Kevin Ashton, the inventor of Radio-frequency Identification (RFID) who also coined the term 'Internet of Things,' accounts for its popularity: “Today computers — and therefore, the Internet — are almost wholly dependent on human beings for information. The problem is, people have limited time, attention and accuracy — all of which means they are not very good at capturing data about things in the real world.” In his view, the solution is to empower devices to gather information on their own with minimal human intervention.

There are various schools of thought around the application of IoT. One school supports its role as a huge value-add to industry, increasing efficiency as well as creating opportunities for further growth. The other is concerned about issues relating to privacy, security and surveillance. There have been nascent implementations of this technology in either pilots or in the form of customized platforms. These do not always lay down clear guidelines or a roadmap to stakeholders who would like their organizations to start extracting value from it, or in most cases, transform processes in a staggered manner to prepare departments for an IoT implementation in the near future.

This paper is designed to help stakeholders navigate the landscape of IoT with respect to key processes in niche verticals. It provides an analysis of the processes most impacted by IoT implementations and concludes with an emphasis on the interplay between Business Process Management (BPM) and IoT and why there needs to be a process framework in place to govern and manage IoT implementations.

The paper has three sections:

- **Introduction to IoT:** Provides an overview of the domain and types of analytics executed with device data
- **IoT for Niche Verticals:** Shows how key processes in healthcare, shipping and logistics, energy and utilities, and the insurance sectors are going to be impacted by IoT
- **BPM and Interlinkage with IoT:** Explores how BPM adds value to the millions of data points generated, by combining IoT architecture and smart processes

Across key industries, we look at how a process perspective improves the value generated from IoT devices and data by automating process execution on sensor data and enabling device tuning and data collection. We dive into how IoT helps deal with unstructured environments by offering process orchestration, thus enabling better decision making.

As a discipline that deals with the analysis, re-design, implementation, execution and monitoring of business processes which now consider both event data and device data generated from sensors, BPM offers a governance structure / mechanism to bridge the gap between the two data types. This ensures that the reams of device data find its way into analysis beyond the device edge, and appropriate business rules can be created to drive the 'action' on the data.

In summary, the paper provides a business case for provision of BPM services in the larger scheme of IoT implementation and the associated business benefits of connecting 'things' to customers.

INTRODUCTION TO IOT

Internet of Things (IoT) has been variously defined as a "network of dedicated objects / things which contain embedded technology to communicate or interact with their internal states or the external environment" (Gartner, IoT e-book, 2017); and "the network of connected smart devices that communicate seamlessly over the Internet" (McKinsey, 2017). In only a few years, some IoT devices have become a part of standard operating processes such as thermostats, smart meters and sensor devices for asset monitoring and maintenance.

There are noteworthy instances where businesses use IoT generated data to better understand their operations and re-ignite customer engagement. For instance, a supply chain management company has deployed sensors on its fleet of pallets, containers and crates for geo-analytics, tracking ambient temperature and other relevant environmental variables.

Several governments have begun initiatives built on the backbone of device data, in the fields of water management, public safety and energy conservation. The healthcare industry is optimizing customer service and sales support with wearables and bio-marker measurements.

The growing cognizance of this market is further supported by the competitive cost of embedded hardware (projected to be ~USD 0.4 by 2020, for an integrated chip). Coupled with reduction in data storage prices and the prevalence of Moore's law in being able to provide higher computing area per chip, Gartner predicts that the world will have more than 20 Billion connected devices by 2020, resulting in 20 zetabyte (ZB) of the 44 ZB data likely to be created from IoT alone.

However, unless it is made actionable, this humongous volume of data generated by IoT is more likely to end up as a burden rather than a source of benefit or competitive advantage. Resolving this challenge is what is likely to drive greater efficiencies in businesses leveraging connected devices in their processes.

Exhibit 1

IoT Units Installed Base by Category (Millions of Units)

Category	2016	2017	2018	2020
Consumer	3,963.0	5,244.3	7,036.3	12,863.0
Business: Cross-Industry	1,102.1	1,501.0	2,132.6	4,381.4
Business: Vertical-Specific	1,316.6	1,635.4	2,027.7	3,171.0
Grand Total	6,381.8	8,380.6	11,196.6	20,415.4

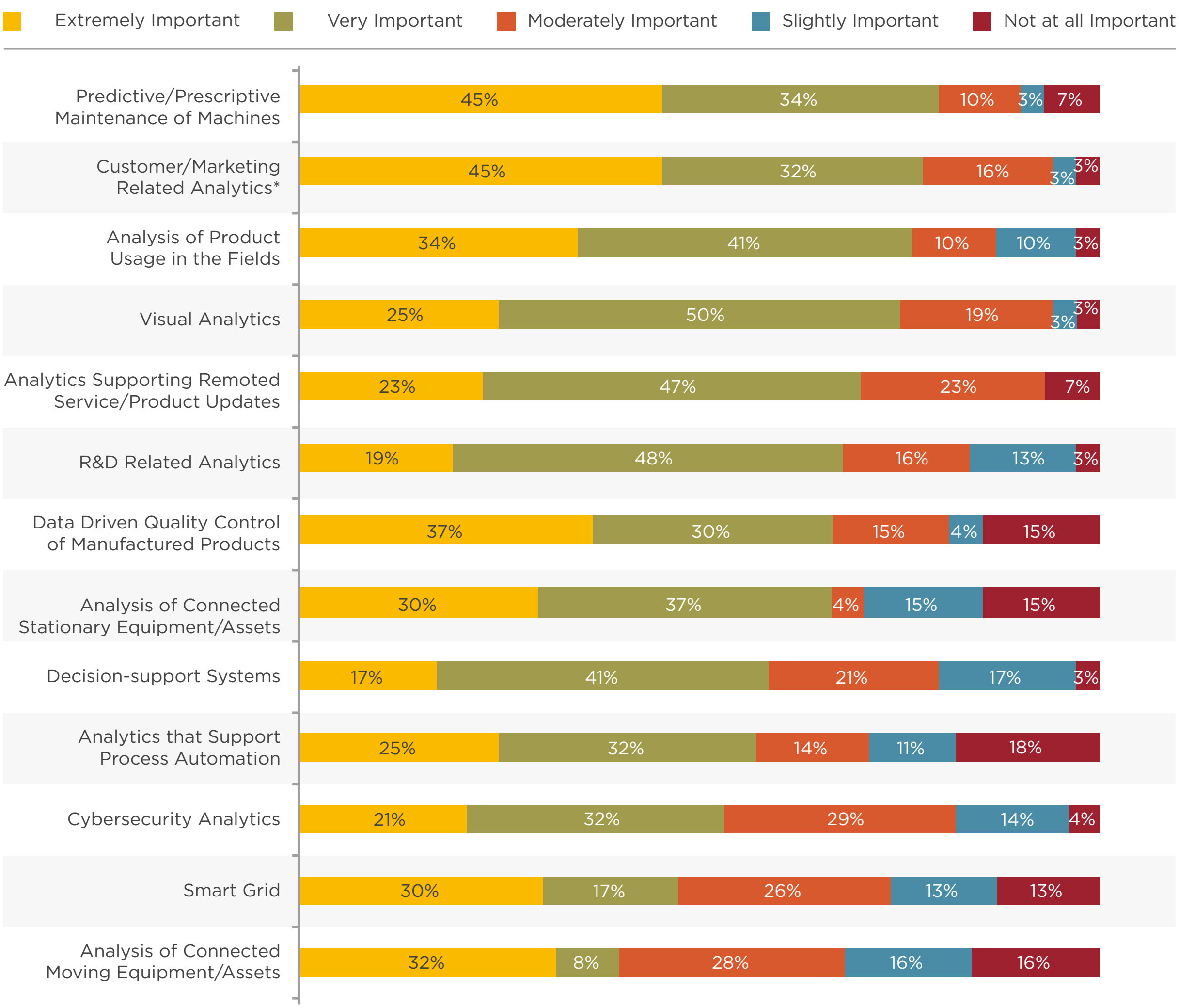
Source: Gartner (January 2017)

Industry-specific applications such as process sensors for electrical generation plants, real-time location in healthcare and field devices in the manufacturing domain will be responsible for driving implementation and use of IoT in 2017. The focus will shift, in the future, onto cross-industry devices which possess the characteristics of higher volume handling and low cost.

While there are risks in deploying IoT infrastructure and associated analytics for organizations, privacy and cyber security being the most notable of them, the anticipated benefits far outweigh the risks. Enabling better decision-making from real-time device data, infrastructure management, increased operational efficiencies, safety and compliance, and new product development are only a few of the areas where IoT and associated analytics are expected to impinge and provide increasingly greater value.

Exhibit 2

IoT Analytics in the Next 1-3 Years



Source: IoT Analytics

With this premise and knowledge, the subsequent sections outline, in brief, the IoT architecture and application of IoT in a few key verticals. The eventual focus is on how the use cases as well as the architecture which is likely to be deployed makes BPM expertise essential for any organization to implement IoT effectively within its ecosystem.

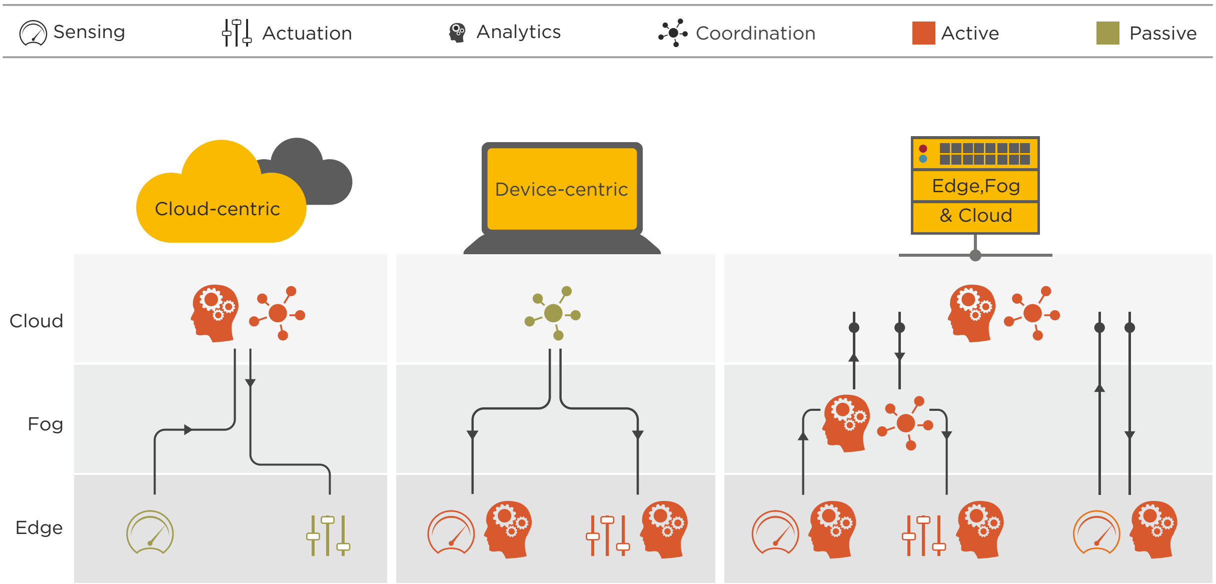
IOT – ARCHITECTURE AND USE CASES ACROSS VERTICALS

The deployment, use and benefits of IoT is predicated upon several heterogeneous devices connected directly or through a gateway device. This enables the devices to communicate with each other and with cloud devices and applications.

IoT architectures can be either cloud-oriented or device-centric. In a cloud-oriented implementation, streaming sensor data is stored in a cloud data center. The data center is the location of analysis where logic, rules and algorithms analyze current and past data, that is then translated to actuators or sensors at the edge. On the other hand, a device-centric implementation allows decisions to be taken on the edge with rules, logic and algorithms embedded within the device.

Exhibit 3

Interaction Models in an IoT Implementation



Source: IEEE, IoT Analytics Across Edge and Cloud Platforms

The above is an emerging model of distributed analytics with the potential for leveraging devices at the edge of the network as well as resources in the cloud. As mentioned earlier, there have been unprecedented advances in devices and processor technologies that have enabled devices to possess significant computing power. This and several other factors have spurred the adoption of edge and fog computing.

Requirement of analysis and infrastructural controls at the edge or device is a prime use case. For example, sensors for measurement of various metrics and gateways enable interaction with sensors and actuators. Quite obviously, the controls for infrastructure management are also located at the edge. Reduction of latency in decision-making is a critical factor responsible for the popularization of edge computing. Data and control transfer between the edge and the data center can take several milli-seconds which induces an undesirable lag in the functioning of time-sensitive applications.

Ultimately, optimizing cloud processing costs, which often work on a pay-as-you-go model, is a key metric in most business implementations. These can often be offset by analytics at the edge which are now more cost-effective than before.

There are three components to an IoT architecture. As mentioned above, this domain encompasses an extremely wide range of technologies as well as devices. Hence, a single reference architecture should not be used as a blueprint for all possible implementations.

At the **IoT Edge**, data is collected and aggregated by devices, actuators and IoT gateways. This is the point where high-volume and high-velocity but low-intelligence analysis is executed. According to IDC, by 2019, 45 percent of IoT data will be stored, processed, and acted on close to or at the edge. **Edge analytics** is embedded in gateways and edge devices, enabling local and real-time analytics on streaming data coming from 'things'. While this eliminates the need for data to travel to platform or enterprise, it can be prone to sporadic outages, as well as suffers from paucity of computing power and high developer overheads to customize solutions.

IoT Platform enables ingestion, storage and analysis of data. **Platform analytics** uses lightweight communication protocols to ingest data from edge devices and carries out centralized analytics, hence allowing for both real-time as well batch analytics. As compared to the Edge, this provides greater data security and quality, but there are integration challenges often observed along with intensive processing power requirements.

IoT Enterprise is where applications, processes and services can be called by the IoT platform and a comprehensive post-facto analysis of data can be done. **Enterprise analytics** provides an integrated view of device data with operational data to allow advanced analytics and eventual process redesign. Enterprise analytics enables association of the IoT data with key processes, thus adding a context to the collected data.

As is expected, analytics at this part in the infrastructure lacks the real-time flavor, ending up with a less comprehensive device view, and insights often getting lost and not implemented at the edge, platform or process level.

With a view of this architecture and the nature of analytics at various stages, we examine existing and potential applications of IoT in relation to four verticals: Healthcare, Insurance, Shipping and Logistics (S&L), and Energy and Utilities (E&U). Further, this background also sets the context for our discussion on deploying IoT in BPM to enable organizations to continually derive value from device data and associated analytics.

IOT ELEVATES HEALTHCARE OUTCOMES

There is no dearth of predictions on how IoT is going to revolutionize healthcare by lowering costs and improving care quality. A Research and Markets study (Nov. 2015) mentions, "The IoT healthcare market is being driven by the rising demand for improved healthcare, reduced cost of care, and evolution of high speed networking technologies and is expected to grow from USD 32.47 Billion in 2015 to USD 163.24 Billion by 2020."

According to McKinsey and Co., IoT will have a potential economic impact of up to USD 1.6 Trillion in the human health and wellness sector globally by 2025. Most of this value will be generated by using IoT-enabled devices to monitor and treat illness.

Connected devices in healthcare span across the ecosystem of payers, providers, durable medical equipment and pharmaceutical manufacturers. Device data such as clinical data, electronic health records, behavioral and wellness data, adherence data and radio-frequency identification (RFID) are being aggregated. The sources of such data are remote systems such as wearables, ingestible sensors, body-function monitoring devices, In-vitro Diagnostic (IVD) devices, physiological monitors, tracking devices and sensors, and also warehouses for drug manufacturers.

Exhibit 4

IoT Analytics in Healthcare

	Payers	Providers	DME	Pharma
IoT data	▪ Clinical data, EHR (electronic health record)	▪ Clinical data, behavioral & wellness data	▪ Clinical data, adherence data, consumer health data	▪ Clinical data, RFID
Source	▪ Remote Systems: Wearables, ingestible sensors & body-function monitoring devices	▪ Wearables and Embedded Medical Devices, Mobile Medical Apps	▪ Physiological Monitors, IVD Devices, Mobile Medical Apps, Wearables	▪ Wearables and Embedded Medical Devices, Tracking devices and sensors in containers, warehouses, trucks
Applications	▪ Identification of patient risk factors ▪ Identification of false claims	▪ Remote patient monitoring (determining if patients' readings put them at risk of health crises) ▪ Dosage monitoring ▪ Urgent-care visits	▪ Remote monitoring ▪ Maintenance of medical devices	▪ Clinical trials ▪ Drug management ▪ Supply chain visibility
Benefits	▪ Reduced cost burden for chronic diseases ▪ Adjusting policies by analyzing risk factors and behaviors in detail ▪ Tracking the spread of diseases ▪ Understanding macro trends in population health	▪ Reduced medical errors in treatment ▪ Improved quality of patient services ▪ Avoiding cost of admissions and automating prescriptions	▪ Faster deployment of software updates ▪ Increased operational efficiency (preventive maintenance of devices)	▪ Better ways of pricing by aligning cost to individually measured clinical outcomes ▪ Improved drug supply chain efficiency and reduced counterfeiting ▪ Reduced expenses in creating and managing drugs

Source: WNS Analysis

The medical device industry is being particularly pushed to explore IoT's short and long-term possibilities. This is exacerbated by the rise of savvy customers focusing on customer experience and higher engagement. Valuable insights that are generated from remote monitoring of connected equipment and wearables are prompting device manufacturers to gradually move from only manufacturing to also care management. Digitization is also being increasingly observed in acute and chronic care, aided by IoT-powered medical devices such as subcutaneous drug delivery units, continuous glucose monitors and vitals' monitoring equipment.

The foray of technology giants such as Google and Apple into the consumer health space, along with healthcare reforms such as consolidation of group purchasing organizations and accountable care organizations, increased focus on value-based healthcare and wellness management are a few other reasons for device manufacturers to put greater focus on innovation.

As a by-product of the above developments, pharmaceutical companies are now partnering with medical device companies to help increase patient adherence to treatment plans. The focus on value-based care in which the providers are compensated based on how their patients fare instead of cost of services performed, has spurred the healthcare industry into measuring patient outcomes accurately.

Advances in IoT of medical devices, often referred to as 'Internet of Medical Things' (IoMT), makes the creation and communication of this data much easier. These advances have also made medicine more participatory, personalized, predictive and preventive. Apart from remote patient monitoring, examples of IoMT include data from infusion pumps that connect to analytical dashboards, and data from patients' beds which measure vital signs.

Besides the increasing use of IoT in healthcare monitoring and delivery, technology also makes it possible for the use of IoT to improve healthcare processes. In particular, it can assist in pediatric and elderly care, chronic disease management and private health requirements. The integration of IoT data and devices makes it possible for a process designer to take decisions, during the design stage, of modeling IoT-aware healthcare processes based on information about sensors to be used, reliability of the sensor type and resource requirements.

For instance, more number of healthcare professionals can be scheduled to assist in a particular procedure, or an increased number of sensors can be placed to collect biomedical data based on the number of observations required to correctly triage the data point. This analysis and more can only be enabled if IoT deployments are process-aware, and process executions are data-aware.

However, the security of sensitive data, such as protected health information regulated under Health Insurance Portability and Accountability Act (HIPAA), passing through medical devices is a cause of concern for healthcare providers.

The United States Food and Drug Administration (FDA) also brings up the perspective of cybersecurity in medical devices as they are increasingly being connected to the Internet, hospital networks and other medical devices – making them more prone to security breaches. At the same time, FDA also recognizes that "these same features also improve healthcare and increase the ability of healthcare providers to treat patients."

Moreover, in the absence of standards and homogenous data formats of device data, as well as electronic health records, medications, prescriptions and vitals, the data aggregation and harmonization to enable any further analysis downstream becomes extremely essential. Hence, IoT services for the medical devices at edge, platform as well as enterprise level will need to focus on addressing this problem before IoMT and associated analytics can be scaled up.

IOT INTRODUCES NEW BUSINESS MODELS IN INSURANCE

Insurance is traditionally seen as a laggard when it comes to adopting new technologies. However, that perception is quickly being put to rest with the introduction of IoT. Early adopters have clearly established value propositions by demonstrating how data from automotive sensors, drones, wearables, telematic devices, mobiles and several other sources can be leveraged to improve key processes in insurance such as risk assessment, loss prevention and customer retention / acquisition.

The most relevant data sources from devices for insurers can be shortlisted to: wearables / personal technology data, sensors on objects such as automobiles and commercial vehicles, and geographical data from Geographic Information Systems that provide access to a variety of environmental variables such as temperature, humidity and topography.

At a broad level, better use of IoT and sensor data gives insurers the opportunity to:

- Create direct relationships with customers based on true and unfiltered usage data
- Gain better understanding of customers and their needs
- Personalize offerings and product attributes / features

Behavioral data such as alcohol or substance abuse, miles driven per week, and intensity of physical activity on insurance applications has often been skewed in favor of the customers. This greater volume of 'true' data has made many analyses possible that were hitherto not practical, or inaccurate at best.

A recent Forbes article outlines how access to such data is spawning new business and operating models. For example, several auto insurance carriers use 'telematics' to gather odometer and speedometer data, patterns of braking and turning, and fueling sensors to provide 'usage-based insurance.' With the increasing deployment of environment sensors, connected biometrics and diagnostics, the positive impact of predictive alerts and improved compliance are already being observed.

An upcoming area anticipated to have a big potential for IoT is 'diagnostics'. Sensors embedded in a variety of products such as electronics and industrial equipment enable IoT. There are specialty insurance providers that are offering extended warranty production on these products along with providing predictive and preventive service before breakdown / component failure. For product owners, this will eventually translate to increased opportunities for up and cross-selling of more insurance products.

The goal of an IoT deployment is not to merely collect data, but to make that data useful and actionable in real-time to relevant processes. The most common endeavor to improve efficiencies, lower costs and increase profits (and eventually increase customer satisfaction) has been process automation. As mentioned before, any IoT deployment thus has to integrate into these objectives to deliver value. Key processes especially underwriting and claims settlement across product lines are deeply impacted by the data being collected from devices.

Lower premiums based on usage behavior, alerts and warnings which intimate the users to take preventive actions before a full-blown damage is caused to the equipment and customized payment plans are only a couple of ways in which existing processes combine with intelligent devices and contribute to the changes in the operating model of an organization. Such a scenario lends itself well to an intelligent case management system. Though there are pre-defined activities which are executed in processing a claim (such as loss review, subrogation, payment and approval / rejection), claims can vary vastly on several characteristics like claim complexity, lawsuits filed, involvement of other providers, and the number of policy holders involved.

Each of the activities can be event driven, such as the arrival of new content, change in user-provided information and third-party inputs which have an impact on the claims processing activity. A case management system can give claim administrators a comprehensive view and control over all aspects of the claim – thus reducing the time in making a decision.

An extremely interesting outcome of the existing and potential implementations will be for insurers themselves. With more than 20 billion devices gathering and transmitting data, providers have to re-assess data storage and analysis of more than 50 trillion GB data (IDC). Greater levels of sophistication in data warehousing and analytics teams, coupled with process changes (such as detection of different risk metrics for premium adjustment) will be required.

Various processes such as underwriting, policy administration, claims triage and settlement will drastically change. While several of these low-level activities are liable to be automated by robotic process automation, human intervention and processes requiring domain expertise will change to a great extent.

IOT CREATES MEASURABLE IMPACT IN SHIPPING AND LOGISTICS

By the very nature of the domain, logistics providers move objects by air, rail, sea and ground and thus operate in widely distributed networks. They rely on rapid information exchange in a multi-modal setting to make transporting decisions.

The e-commerce market has also changed the nature of shipping and delivery practices with incessant customer demands of same-day deliveries, thus nudging S&L providers to improve logistics. As a result, operators have been quick to see the benefits of IoT.

Connected devices affect the processes of shipment tracking, warehouse capacity optimization, predictive asset maintenance, last-mile delivery and route optimization among others, broadly impacting the below:

End-to-End Visibility

IoT-enabled mobile devices (RFID, barcode scanners and mobile computers) improve supply chain visibility and operations. Complete visibility enables companies to make more effective and timely decisions to reduce delays by detecting issues faster. Many transportation and logistics companies using RFID today are reaching nearly 100 percent shipping with 99.5 percent inventory accuracy, 30 percent faster order processing and 30 percent reduction in labor costs.

Warehouse and Yard Management

Distribution centers, warehouses and yards form the most critical units of the supply chain ecosystem. Increasing performance through IoT would mean increased efficiency, wherein connected devices track inventory data, equipment and vehicles. These devices capture and share data so that right products are in the right place at the right time.

Fleet Management

IoT allows organizations to facilitate need-based maintenance and eliminate unnecessary responses by gaining intelligence remotely around assets in the field. Workforce enablement is another incentive which the technology offers by providing insights into maintenance history, parts availability and inventory records, in addition to pre-emptive updates on conditions such as traffic or weather to equip the workforce to respond better. Connected devices also afford the ability to have access to real-time visibility into driver and vehicular performance, allowing field executives to increase driver safety via pre-defined processes, and reduce insurance related costs.

Operations Management

While there are several Manufacturing Operations Management (MOM) systems which have been in use in manufacturing plants for a long time now, they don't allow the flexibility of connectivity, cloud storage, application development and heterogeneous data analysis. IoT enables faster integration and access to device data from a platform. Enabling smart processes in manufacturing plants leads to higher productivity levels.

Data collection and storage for improving operations has become more complex over the last few decades with both the volume as well as variety of data expanding. Smart processes working on data from connected devices aid in preventing production delays, improving production line performance, reduce equipment downtime and increase process efficiency. Utilization of unconventional data sources such as geolocation data and video streams from devices can help improve workforce safety as well as quality.

IoT platforms which can integrate with MOM solutions and vice versa will gain competitive advantage. To this end, manufacturers should consider strategic IoT deployments along with the existing MOM infrastructure.

Product Usage Tracking and Remote Diagnostics

This is specifically relevant to asset-intensive industries where critical machinery and plants are required to operate at peak efficiency and minimal downtime. A reactive approach often leads to huge losses and customer churn, both of which are cost prohibitive. With connected devices, IoT data collection and integration enables reduced time to repair and upgrade products and firmware remotely, thus bringing down workforce costs.

The ability to monitor remotely and undertake preventive maintenance along with tracking usage characteristics will need to be embedded into enterprise processes. This will ensure the creation of innovative customer service models and more agile processes.

Reverse Logistics

Important processes such as returns, inventory counting, pallet tracking and damaged inventory disposal are usually manual processes at a warehouse. Returned packages should be examined manually, sorted, re-packaged and re-labeled. However, automation in warehouses is posing viable return on investment with the introduction of connected devices which are also low in cost.

IoT devices and sensors which communicate the state of the product to the data center undoubtedly will aid in such operations, along with the help of other technologies such as robotics or beacons.

Mere management of inventory to gain real-time visibility solves problems at each stage of the reverse logistics chain. With increased customer expectations and greater focus on customer service, reverse logistics is as important as forward supply chain processes.

With a staggering increase in product returns owing to fierce competition in e-commerce as well as higher efficiency pressures on brick-and-mortar retailers, the cost of pick-up from customer location is transferred to the organization. Third-party logistics further complicate the chain, involving another layer of delivery center before the goods reach the warehouse.

Smart tags for sorting products and merchandising solutions have already found widespread use in most warehouses. Damaged or end of lifecycle goods can be identified for replacement, reuse or re-manufacture. Imperatively, a strong reverse logistics strategy is essential for most organizations.

The above scenarios hint at the fact that IoT not only improves the efficiency of operations, but aids in the development of new operating models as well. Between 2017 and 2040, the volume of cargo shipped via trucks (which are largely responsible for the last-mile delivery) is anticipated to see an increase by 43 percent, from 13.2 Billion tons to 18.8 Billion tons. Railways are expected to see an increase of 37 percent, and air cargo is anticipated to grow by 250 percent.

IoT is affecting both the supply side as well as the demand side in S&L. There are several processes impacted, such as capacity sensing, planning and reporting, route optimization, energy management, fault deduction and resolution (utilizing predictive maintenance), and threat detection and prevention.

Evidently, shifting to an accurate and timely master data management (requiring process automation), real-time inventory management, and transparency with trading partners around a single source of data and supply chain processes is the need of the hour. Coupled with the fact that all these need to be scalable and modifiable to integrate with several partners along the value chain makes for a resounding case for an IoT services proposition around S&L processes.

Like all other domains, the value of IoT for the logistics domain is also governed by the flow and use of information. Increased visibility into data, delays, process runs and outliers enable pay-as-you-go models as mentioned previously. This also allows for data as well as process analysis at each step – inventory management, predictive asset maintenance and the supply chain.

IoT technology is also slowly but gradually shifting quality control and dynamic supply chain design, based on immediate knowledge of natural calamities and other events. The information can eventually be used to tweak the timing / mode of shipment to minimize the disruption. Hence, both efficiency improvement of existing processes, as well as more responsive and agile business processes are enabled by IoT. A process perspective also allows IoT devices and the streaming data to be directed to the appropriate execution process for maximum utility.

IoT Helps Balance Conflicting Objectives for Energy and Utilities Players

E&U companies are today seeking to improve business processes to address regulatory, market and cost pressures. They are exploring newer avenues of power such as renewable and distributed power generation, along with re-defining customer experience in what has been a behind-the-scenes industry for too long. Interestingly, IoT is a double-edged sword for this sector. While simultaneously navigating market developments which impact cost of energy, this sector also has to deal with customer-centric revenue models such as smart grid / metering infrastructures and time-of-use pricing.

While these new business requirements introduce flexibility into business processes and make operations more agile, they also have the potential to bring down revenues and are fairly capital-intensive. Typical pain points for a utility sector are high customer churn, high cost-to-serve, low customer engagement and increasing bad debt expenses. The industry is looking to leverage technology for good measure to exceed customer expectations.

Hence, while initiating technological advancements in infrastructure, the utilities sector almost mandatorily should focus on operational efficiencies simultaneously. Smart devices, business process management systems and big data form the ecosystem for operational efficiency.

IoT in some form or shape has been adopted by 36 percent of utility companies. Smart grids, smart meters, and asset monitoring and maintenance are three areas where capabilities of connected devices are expected to show substantial impact in utility companies. The installation of smart meters is on the rise already. In 2014, 94 million smart meters were shipped worldwide, and the installed base is expected to rise to 1.1 billion by 2022.

Smart metering is gradually becoming the core of utility business, given that meter data is the source of all measurement and analytics. Smart meters allow fully automated billing based on time-of-use or network status (for example, with prices rising and falling according to peak and trough usage). It will also enable meter-to-appliance communications to help change consumer consumption patterns.

Through utilizing sensors in IoT systems, intelligent networks / smart grids can be built across geographies. This will help load sharing and in real-time grid monitoring. With embedded software being used to monitor asset health, these sensors will also learn with more data and possess a more sophisticated intelligence layer. Hence, data collection through IoT devices will empower utilities to improve energy efficiencies, services and customer engagement.

Using a variety of connected devices, utility operators also better understand the condition of the entire asset network close to real time. Variables such as temperature, pressure, flow, radiations, vibrations and calibrations are collected through devices. Apart from being safer for the workforce, this is also accurate, albeit a more cost-intensive method to capture asset states. Maintenance workers and analysts can then use this information to help plan for preventive maintenance of both above-ground and below-ground assets.

To enable existing processes to become more flexible and create new processes which support the above complex implementations, utility companies will have to rely on process frameworks and Workflow Management Systems (WFMs) which allow essential processes such as meter-to-cash, demand response, and risk and compliance to be changed and measured. In brief, IoT has numerous use cases along the complete value chain of energy generation, transmission and customer service.

Exhibit 5

Role of IoT Across the Utility Value Chain

Generation and trading	Transmission	Distribution and Marketing	Storage	Marketing, Sales & Service	Customer
▪ Virtual Power Plants (VPP) ▪ Remote monitoring and control of decentralized generation ▪ Digital supply chain (data integration with suppliers) ▪ Energy management for private installations ▪ Real time energy trading/ straight through processing	▪ Condition monitoring ▪ Grid stability based management of renewable generation	▪ Smart metering and variable energy tariffs ▪ Smart grids ▪ Remote control of grid assets ▪ Condition based maintenance ▪ Digital/ mobile workforce ▪ Digital supply chain (data integration with suppliers)	▪ Integration of decentralized storage facilities ▪ Vehicle-to-Grid	▪ Self-service portals ▪ Social media marketing ▪ Gamification ▪ New products ("energy plus information") ▪ App based mobile services ▪ Analytics based customer segmentation and pricing ▪ Performance marketing	▪ Smart Home ▪ Demand response management ▪ Cross-energy management/data mining based efficiency systems ▪ E-mobility/ Vehicle to Grid

Source: WNS Analysis

CONVERGENCE OF IOT AND BPM

A recent CISCO survey revealed that only 26 percent of all organizations surveyed actually consider their IoT initiatives successful. The key factors slowing IoT progress are:

- Long time to completion
- Quality of data
- Internal expertise
- IoT integration
- Budget overruns

There are significant differences in the perceptions of information technology executives and business leaders regarding the implementation of IoT. While a sizeable 35 percent of executives considered their initiatives successful, only a meagre 15 percent of business leaders shared the same views. The latter placed far greater importance on strategy and processes as opposed to the former, which focused more on technologies, expertise and vendor selection.

As mentioned earlier in this report, while all kinds of connected devices are the torchbearers of accurate data collection, there still exists a disconnect between integrating these powerful devices with critical business processes.

A process-oriented approach and best practices are the link which will enable IoT data to support key business initiatives. While an IoT infrastructure excels at sensing and collecting data from the environment, structured business processes focusing on system integration and processing logic will be able to support event tracking and analysis, data processing and eventually delivering results to business users / edge devices.

This appears to be a natural fit – the combination of BPM and IoT allows processes to be adaptive and data-driven. BPM contributes to IoT by enabling organizations to push more intelligence into the edge devices and this dictates the need for more processes and rules to drive events and analysis on the edge.

Adding intelligence to the processing of standalone edge devices will require not only analytical capabilities but those related to event data processing and pattern analysis as well. This will allow local execution of automated activities based on processes controlled by process management engines.

Workflows will have to play their part — connecting smart objects through Application Program Interfaces and connecting the user system to automated systems and processes. This will allow the apps to perform their functions optimally.

Another layer of benefit that managed workflows and event data logging will provide is the wealth of data such as what service was used, where the GPS was turned on / off and for what purpose. Essentially, this will create a repository of time-stamped device usage data.

Post-facto analysis of such event logs will enable developers to create more contextual systems with optimized sensor placements and provide visibility into performance data to undertake predictive and preventive maintenance of devices.

As observed in our discussion of implementations and potential use cases across niche verticals, devices can be integrated with business processes such as safety checks and client provisioning, optimizing work allocation, task routing as well as debt collection processes. It is the process management engine which will manage the control flow, generate tasks and activities, or specifically initiate them based on the parameters decided beforehand by the business.

The combination of BPM and IoT allows processes to be adaptive and data-driven. BPM contributes to IoT by enabling organizations to push more intelligence into the edge devices and this dictates the need for more processes and rules to drive events and analysis on the edge.

Edge analytics is also gaining prominence, however not without significant gaps, as per IEEE. Drawing parallels with transition from feature phones to smartphones, IoT analytics needs interventions in the form of platforms for app development as well as pure services based on the cloud. Within organizations, this translates to the BPM groups being deeply involved in the deployment and managing of IoT, to do more than edge analytics or basic process automation only on event data.

The value of IoT is not only in the data, but how it can be leveraged for action. Since 'things' are now active participants in processes which were traditionally designed for humans, dynamic processes which can instantiate from these 'things' is a pervasive use case (for example, activating an exception process or a case). Real-time complex event correlation to assess a potential fault is also a capability that the network of devices needs to possess.

With device data, a real-time understanding of resources, constraints and the environment can be achieved to a certain extent. Business goals are easier to meet when there is a structured and algorithmic way to solve problems with access to complete data to all stakeholders at all points in time. While the IoT- BPM integration is in its nascent stage, this is the only combination of technologies with the potential to meet the needs of successful IoT implementations.

References

i. https://www.gartner.com/newsroom/id/3185623

ii. https://www2.deloitte.com/insights/us/en/focus/internet-of-things/iot-in-shipping-industry.html

iii. https://www.pwc.com/us/en/increasing-it-effectiveness/assets/future-of-the-internet-of-things.pdf

iv. https://www.mckinsey.com/industries/semiconductors/our-insights/whats-new-with-the-internet-of-things

v. http://www.abb.com/cawp/seitp202/d31c2dacd0f8ac8ec1257f8600483b3f.aspx

vi. https://www.computerworld.com/article/3192085/internet-of-things/ceos-rate-productivity-very-low-from-emerging-tech.html

vii. https://www.fda.gov/MedicalDevices/DigitalHealth/ucm373213.htm

viii. https://www.idc.com/research/viewtoc.jsp?containerId=259856

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