IoT Analytics: A Growth Driver for the High Tech Industry

Abstract

To maximize value from the opportunities presented by the Internet of Things (IoT), high tech companies are reimagining business models and driving new initiatives aligned with their business strategies. Analytics plays a defining role in IoT strategy development and implementation, and must be leveraged to maximize the IoT potential.

Analytics based forward-looking insights are crucial for digital transformation of any product or service, and IoT data is a stepping-stone to achieve this. Whether sensor data is used to enhance operational efficiencies or reinvent functions such as customer support, supply chain, customer experience, and factory operations, the success of IoT deployments depends largely on the effective use of analytics and predictive insights.

To harness IoT data, organizations must build a digital infrastructure for large-scale deployments, and invest in data scientists to drive meaningful predictive, prescriptive, and cognitive insights. This paper outlines some best practices for high tech organizations looking to tap into the potential of IoT analytics.

Why IoT Analytics is a Must for High Tech Companies

The high tech industry is characterized by continuous digital disruption, globally dispersed value chains, service-centric innovation, and a fundamental need to be at the forefront of the digital revolution. IoT analytics is an invaluable tool for driving growth in this complex business environment, and should be on every organization's radar.

According to the TCS Global Trend Study 2015[1], 'Internet of Things: The Complete Reimaginative Force', top IoT use cases for high tech companies are aimed at improving services, enabling product usage analysis, and shifting to the product-as-a-service model. Other areas where IoT analytics can play a vital role include enhancing supply chain management, improving factory operations visibility and employee services, and creating smarter buildings.

Fusing data from sensors, the enterprise, and the internet, IoT analytics helps high tech companies deliver visibility, intelligence, and predictive insights. These insights lead to growth opportunities by embedding operational efficiency into enterprise processes and creating new revenue streams, for instance, a connected data marketplace.[2] Given the immeasurable potential of the IoT, industry players are already tweaking their business models, according to the TCS study (see Figure 1).

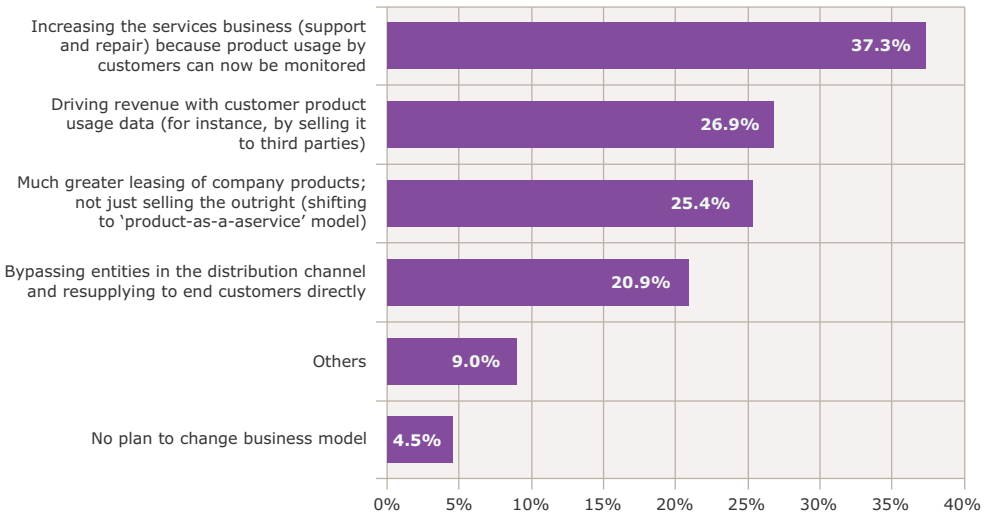

Figure 1. IoT-led Business Model Changes that High Tech Companies are Planning to Make by 2020

Figure 2 provides examples of IoT analytics by functional area, and the impact on key KPIs.

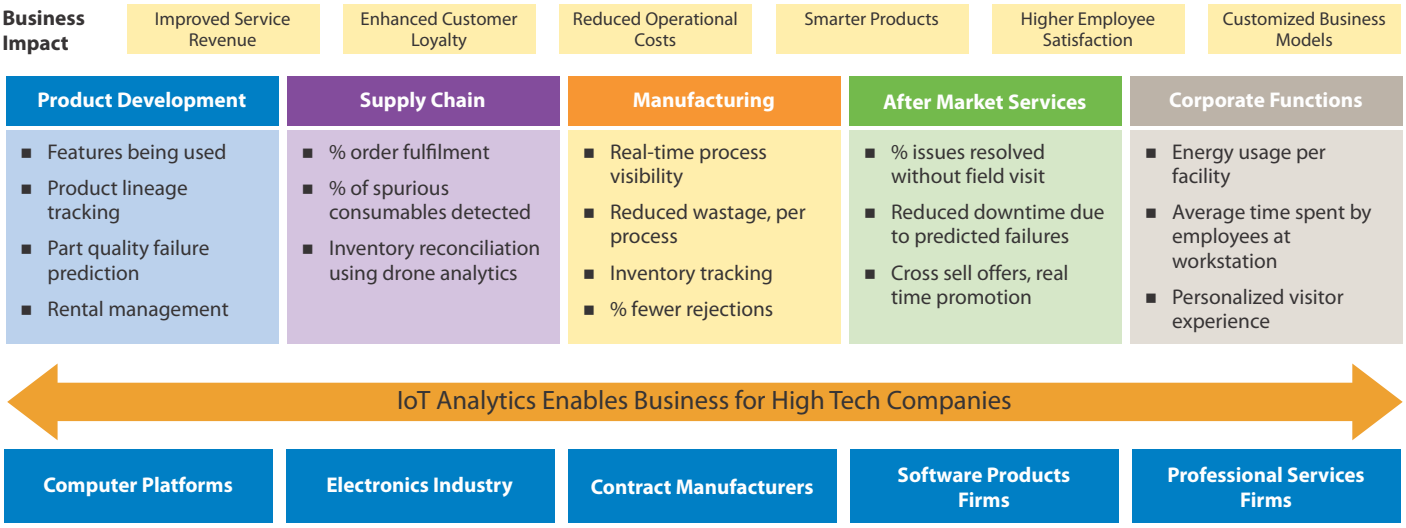

Figure2. The Impact of IoT Analytics on Key KPIs

IoT analytics in high tech fall into different categories based on the monitored entity, such as the product or customer, as depicted in Figure 3. It can also be categorized based on the functional area, product category, or business function where it is deployed. Each IoT use case must clearly define the type of analytics needed to measure, monitor, report, analyze, calculate and predict, and finally, link it to a business KPI.

Figure 3. Monitored Entity-based Categorization of IoT Analytics

IoT architectures are undergoing transformation and nearing maturity across three distinct tiers – the edge, the platform, and the enterprise layer. Today, organizations can deploy business rules and algorithms at any tier, giving them an unprecedented advantage. Let's take a look at some best practices that high tech companies must follow if they are to maximize the potential of IoT analytics.

Implementing IoT Analytics: Ten Best Practices

High tech organizations must consider the following aspects when embarking on an IoT analytics program:

1. **Prioritize and select use cases correctly**
   - Understand existing business challenges and the problems being solved, along with the benefits and new insights that IoT data will provide.
   - Select the right use cases for agile and quick wins.
   - Think beyond basic remote diagnostics and agree on the impacted KPIs.
   - Follow top-down approach to drive IoT initiatives.
   - Develop small scale, but well carved out pilots.
2. **Manage data diversity**
   - Assume device and protocol heterogeneity with IoT datasets.
   - Bring data onto a common IoT platform by creating agents and customized adaptors.
   - Consider platform options – on premise, cloud, types of connectors and in-built adaptors, device management – and open source and connectivity options to edge devices.
3. **Standardize IoT architecture**
   - Use interoperable reference architectures readily available and tested for current and future use cases and lines of business.
   - Plug open source components into existing commercial platforms for superior solutions.
   - Invest in simulation and design, cloud, API infrastructures, and ERP integration.
   - Analyze if real-time or batch-mode processing, or a combination of both, is needed.

- Standardize the architectures and technologies that best fit your IoT needs with the help of IT.
- Develop frameworks for data ingestion, storage, processing, access, forecasting, and visualization that are best aligned to the use case. Industrial Internet Reference Architecture (IIRA) is one of the emerging frameworks for Industrial IoT applications.[3]

4. Develop analytical models

- Identify KPIs and thresholds to measure model performance in production.
- Use historical data to understand real-world scenarios and build accurate data models. Since this may be difficult for greenfield use cases, collect sufficient raw data and events before embarking on advanced analytics.
- Develop statistical models for futuristic, what if, and predictive scenarios – this is where analytics can play a vital role in the future.
- Develop models centrally and plan for periodic health checks.

5. Ensure data quality

- Verify sensor data; for instance, check for missing or incorrect values, and signature mismatch.
- Invest in analytical methods such as time series, anomaly, streaming, CEP, pattern matching, and so on.
- Ensure quality and timeliness of data; build tools and strengthen data science capabilities.
- Build consensus among IT and business stakeholders on what data will be monitored, measured, tracked, and reported.

6. Design for scalability

- Ensure clarity on the type of data to be collected, frequency of collection, data fusion with other sources, data ingestion bottlenecks, future capacity planning, and how to store, analyze, and visualize the data sets.
- Choose the deployment as per latency and reliability requirements – analytics on the edge, local or centralized server, and real-time versus batch mode.
- Apply three-axis scaling approach for your application. For instance, horizontal scaling using multiple servers, vertical scaling based on actions, and z-scaling based on request or response transactions.

7. **Optimize data storage**
   - Use the best technology suited for data storage for different kinds of analytics; for example, array or column oriented.
   - Build different kinds of analytics applications such as interactive querying, batch oriented and streaming analytics, and machine learning algorithms, and create alerts using the best-suited technology components.
8. **Define security and data ownership**
   - Make it a top priority to address the data privacy, ownership, and relevant regulatory issues, during use case definition. Organizations can better evangelize data monetization if data ownership is clearly defined.
   - Leverage data security mechanisms like client or device authentication, communication with trusted servers, trusted platform modules for storage of private keys and root certificates, secured boot-strapping, use of API keys and DTLS, TLS, or SSL protocols for network security
   - Assess the use of blockchain technology to ensure the digital identity of assets.
9. **Optimize data visualization**
   - Optimize data visualization. For many IoT applications, user experience determines the architecture and flow of data between devices and back-end systems.
   - Finalize the interface, method, and frequency of updating data because users interact with front-end applications.
10. **Leverage digital skills**
    - Select a skilled team with expertise in core analytics, data science, domain experience, cloud platform, Big Data, machine learning, visualization, web and mobile application development, and image analytics to ideate, develop, deploy, and maintain a full-fledged analytics solution for a large program.

Early Adopters are already Reaping the Benefits of IoT Analytics

With several million things getting connected through the IoT, it is clear that high tech companies need a structured approach to ingest, store, analyze, enrich, query, and visualize their datasets. Although most datasets will come from connected devices, they will also be supplemented by other sources such

as weather, holiday season data, stock prices, and enterprise systems. The consolidated insights can then be fed into enterprise or consumer IoT applications.

A number of high tech companies are starting small with IoT analytics implementation and reaping early benefits, using the results to build or revisit business cases. This approach helps organizations understand what can be insourced and what cannot. Collaborating with partners and industry experts is the ideal way to supplement internal expertise.

Wth the IoT, granular data patterns, machine learning, and contextual and cognitive intelligence can be applied to sensor data at a much larger scale for greater business impact. It helps companies enhance customer experience, operational efficiency, generate new growth opportunities and increase productivity. For high tech companies looking to maintain an edge, now is the right time to invest in IoT analytics and prepare to leverage its transformative power.

References

[1] TCS, Internet of Things: The Complete Reimaginative Force (2015), Accessed on 15 April 2017, http://sites.tcs.com/internet-of-things/

[2] TCS, IoT Data Marketplace: The Next IoT Frontier (2016), Accessed on 22 April 2017, https://www.tcs.com/internet-of-things-data-marketplace-next-frontier

[3] Industrial Internet Consortium,Industrial Internet Reference Architecture (2105), Accessed on 22 April 2017, http://www.iiconsortium.org/IIRA-1-7-ajs.pdf,

About The Author

Sukriti Jalali

Sukriti Jalali heads Blockchain and IoT initiatives for TCS' High Tech business unit. She is responsible for developing IoT and blockchain solutions and services for TCS' clients, as well as supporting their digital and enterprise transformations. With over 22 years of experience, Jalali has played several key roles across consulting, technology solutions, delivery, program management, and pre-sales in the engineering and high tech domains.

She has presented papers at various industry forums including the Embedded World Conference and the Institute of Electrical and Electronics Engineers (IEEE). She holds a Bachelor's degree in Technology from the National Institute of Technology, Kurukshetra, India.

Contact

Visit the Hitech page on www.tcs.com

Email: HiTech.Marketing@tcs.com

Subscribe to TCS White Papers

TCS.com RSS: http://www.tcs.com/rss_feeds/Pages/feed.aspx?f=w
Feedburner: http://feeds2.feedburner.com/tcswhitepapers

About Tata Consultancy Services Ltd (TCS)

Tata Consultancy Services is an IT services, consulting and business solutions organization that delivers real results to global business, ensuring a level of certainty no other firm can match. TCS offers a consulting-led, integrated portfolio of IT and IT-enabled, infrastructure, engineering and assurance services. This is delivered through its unique Global Network Delivery Model™, recognized as the benchmark of excellence in software development. A part of the Tata Group, India's largest industrial conglomerate, TCS has a global footprint and is listed on the National Stock Exchange and Bombay Stock Exchange in India.

For more information, visit us at www.tcs.com

Experience certainty. IT Services
Business Solutions
Consulting

TCS Design Services I M I 06 I 17