



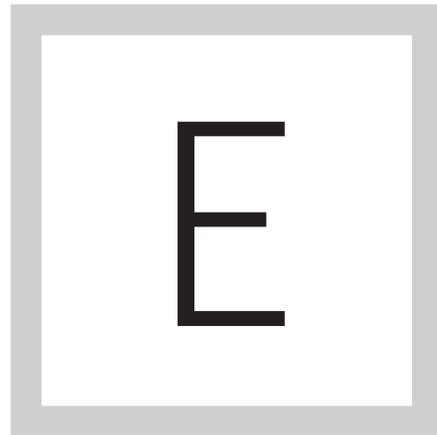
► *E-Guide*

THE EVOLUTION OF IOT ANALYTICS AND BIG DATA

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ENTERPRISES ARE ALREADY recognizing the value that lies in IoT data, but IoT analytics is still evolving and businesses have yet to see the full potential of self-service and AI-powered technologies like machine-learning. Hear from Sisense co-founder Adi Azaria and Machina Research analyst Emil Berthelsen about the current state of IoT analytics, BI, and big data management as well as where it's all heading next.

THE OTHER INTERSECTION OF IOT AND ANALYTICS

Adi Azaria, Co-founder

Early in 2017, it would seem that the internet of things is poised to have a large impact on the business world in the upcoming years. While it seems that in the realm of consumer products IoT has yet to present a compelling value proposition for most buyers, businesses are already seeing the benefits of collecting data from a myriad of connected devices and sensors, and then using this data to optimize ongoing processes.

This is particularly true in industries such as energy, transportation and manufacturing - with Business Insider predicting that global manufacturers will invest \$70 billion in IoT solutions in 2020. Other industries such as health-care and telecom are also introducing wearables, smart devices and sensor data to gain unprecedented real-time understanding of their operations.

WHAT DO WITH ALL THIS DATA?

This wealth of new data sources naturally leads the business world to think of ways to introduce IoT to another growing IT trend, which has already gained

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mainstream traction - namely the world of business intelligence (BI) and data analytics. Obviously the sophisticated tools and technologies developed to rapidly query and visualize large, disparate datasets could prove useful when trying to drive insights from the massive streams of data generated by IoT devices.

The need for such technologies become even more acute considering the findings of a recent report by Verizon (requires registration), which states that “despite the huge revenue potential that data monetization presents, our Oxford Economics study found that today only 8% of businesses are actually using more than 25% of their IoT data.”

The BI industry could offer solutions for companies that work with IoT technologies by providing them with the same visual techniques employed by business analysts to create dashboards and analyses from traditional databases. IoT data is often different in that it is less structured and more volatile than most sources, but as business analytics matures and grows capable of tackling increased data complexity, modern BI tools will undoubtedly present benefits for driving increased business benefits from IoT.

In this model, the relationship is one-way: Data is pulled from IoT devices into an existing data mart or data warehouse, and BI provides a layer for visual analytics based on the massive datasets being generated. And while this use

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case is definitely viable, there is another often overlooked potential for combining the worlds of BI and IoT: namely, using IoT devices as a means to consume and interact with business intelligence insights.

A TWO-WAY RELATIONSHIP

In this model, IoT devices are more than mere data sources; they are a way for the business to communicate the results of data analysis to line-of-business business employees and to create more data-driven organizations by bringing the data physically closer to the people in the organization, and to represent it in new audio-visual ways.

While there is a lot of hype around the term “data-driven,” the fact of the matter is that for most business workers - i.e., those without an IT or data analysis background - access to data is often far from immediate or obvious. Some departments, such as marketing, have grown more accustomed to using analytical tools in their daily work; others, such as human resources and sales, are often less familiar with the various digital systems used to generate reports, mash-up data or create dashboards.

These types of less-technical users might want to adopt a more data-oriented strategy and work based on measurable KPIs - but they don't necessarily

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want to log into a dashboard application every few hours and learn how to use this new and powerful digital system merely to know that they are on track in terms of a handful of KPIs. They need simpler, more streamlined ways to interact with the data, one that would actually correspond to their use case.

This is where the IoT comes in: The beauty of all of these connected devices is not merely their ability to transmit data, but also to receive data through the World Wide Web and change their behavior accordingly. By connecting IoT devices such as smart lamps and wearables to business intelligence systems, end users can receive instant notifications for important changes in their data - through a change in light, sound or vibration of a wearable device. This gives them a cue to interact with changes in their KPIs by taking an appropriate response (e.g., a retail store manager sees a contextual light switch from red to green, indicating a drop in sales).

Further potential lies in the use of personal assistant tools (such as Amazon's Alexa or Apple's Siri) within smart BI applications, to enable users to have a voiced, natural-language conversation regarding their data and KPIs. This again serves to make data analytics more accessible by removing the dashboard - which in this case is a somewhat unnecessary "middleman" - and connecting the business worker directly with the data.

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MORE TO COME... SOON

We are now at the tip of the iceberg when it comes to IoT. While BI technology is reasonably mature, we are yet to see exactly where the IoT train is headed and the ways in which it will manifest itself in the business world. However, the growth trajectories of these two industries - alongside other emerging technologies such as machine learning and natural language processing - is sure to introduce new intersections and combinations, as well as new data-driven methodologies within the business world.

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THE CHANGING LANDSCAPE OF IOT DATA AND ANALYTICS

Emil Berthelsen, Principal Analyst

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Wave interference is the technical term for when two waves meet. The resulting displacement or superposition is the combined net effect of each wave. IoT data and analytics reflects in many ways the superposition between IoT and big data.

IoT is a continuously evolving concept, and some definitions include IoT data and analytics as part of the concept, yet fundamentally, the Internet of Things is the network of physical objects or things, digitalizing information about the environment and exchanging that data across the existing Internet structure. Big data too has not been immune to various definitions, and one of the more commonly applied understandings is that by McKinsey that big data are “datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyse.”¹

These two waves, IoT and big data, have started to meet, and not only that, have had a significant multiplier effect on the superposition outcome. The number of connected devices continues to grow and accelerate with the

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demand for more and more data. The value of data has also started to change in a positive direction with more and more insights achieved with real-time data sources and data aggregation.

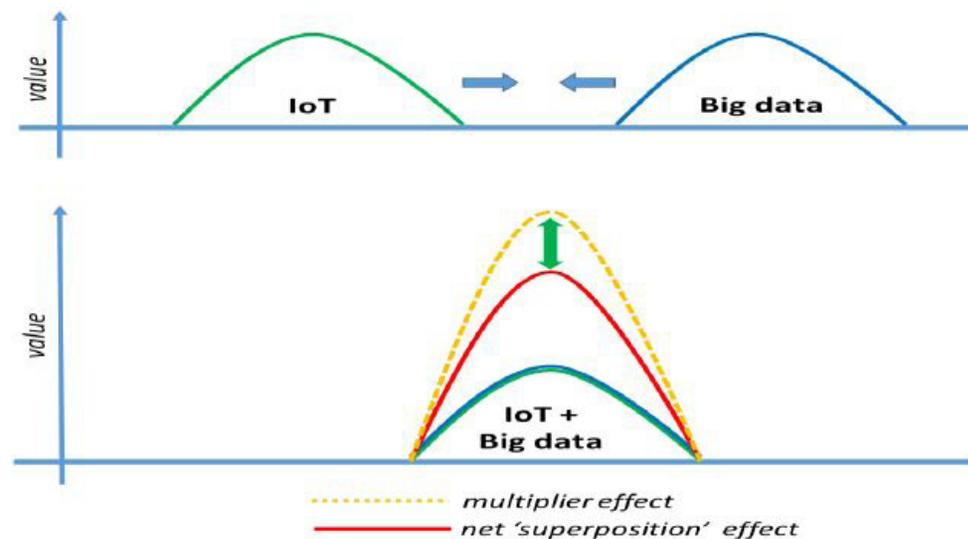


Figure 1: Value merge of IoT and big data waves with a multiplier effect. (Source: Machina Research, 2016)

The combination of IoT and big data has had its demands on enabling technologies. Fast data has generated new requirements in terms of data ingestion and in-stream processing. Big data has placed new requirements on data storage

and how schema and queries are managed. Let's examine these in slightly more detail.

FAST DATA BECOMES AN IMPORTANT GAME CHANGER

Big data is an important factor in IoT data and analytics, however the fundamental and more significant change that has taken place in data management and analytics has been driven by the speed with which data is now being processed and fed back into action in near real-time. From traditional batch processing with historical analytics driving insight over periods of days and weeks, fast data is about real-time ingestion and in-stream processing of data, down to seconds and milliseconds of actionable feedback. Examples of database providers able to meet these requirements are Exasol, SAP HANA, SQream and VoltDB. Fast data does away with a fairly traditional extract-transform-load (ETL) approach and has pushed the analysis of data from a back-end business intelligence activity to a critical front-end application plus feature; application plus referring to the expected outcomes of such applications as predictive maintenance or prescriptive decisions for medication routines, both involving a degree of machine learning/advanced analytics.

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BIG DATA IS THE CHALLENGE ON THE OTHER SIDE OF THE COIN

Big data is not a new phenomenon. Big data has become an increasing challenge for many enterprises, and enablement technologies such as Hadoop are really what have driven this new opportunity space. With Hadoop, or more specifically HDFS for distributed file storage and MapReduce for distributed processing, enterprises were finally able to scale-in and scale-out their data storage requirements in a more flexible and cost efficient manner rather than the more traditional “more data, one more server” approach. Examples of database providers here would include Cloudera, Hortonworks and MapR.

Big data has also been about variety of data and not just volume. Here, NoSQL databases² or new hybrid databases have pushed boundaries, creating schema on the fly or on read, and dispensing with the more cumbersome and limiting RDBMS columnar approach. As the growth in numbers of connected devices continues, the richness and variety of data sources will continue to expand, and from highly structured data, enterprises will need to work with semi- and as well as completely unstructured data to gain the additional value from data aggregation.

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THE VALUE ENGINE IN IOT DATA AND ANALYTICS

The creation of value comes from all the components in an end-to-end IoT application. Devices contribute to the value. Connectivity contributes to the value. Applications certainly have a major contribution component as does the data and the analytics. What is interesting to consider, as illustrated by the multiplier effect in the two-wave model at the start of the article, is the net effect combining IoT and big data has - a superposition or multiplier effect which is greater than the parts.

Data is a reusable commodity, and where value may initially be unlocked from the single data point in real-time, the aggregation of single data points, real-time and historical will also yield additional and valuable insights previously unidentified.

¹McKinsey Global Institute, “Big data: The next frontier for innovation, competition, and productivity,” May 2011

² For some more information about NoSQL databases, read the Machina Research Research Note, “Why NoSQL are needed for the Internet of Things,” April 2014

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