ARUNDO

SMART IRON: INDUSTRIAL OEMS AND THE INTERNET OF THINGS

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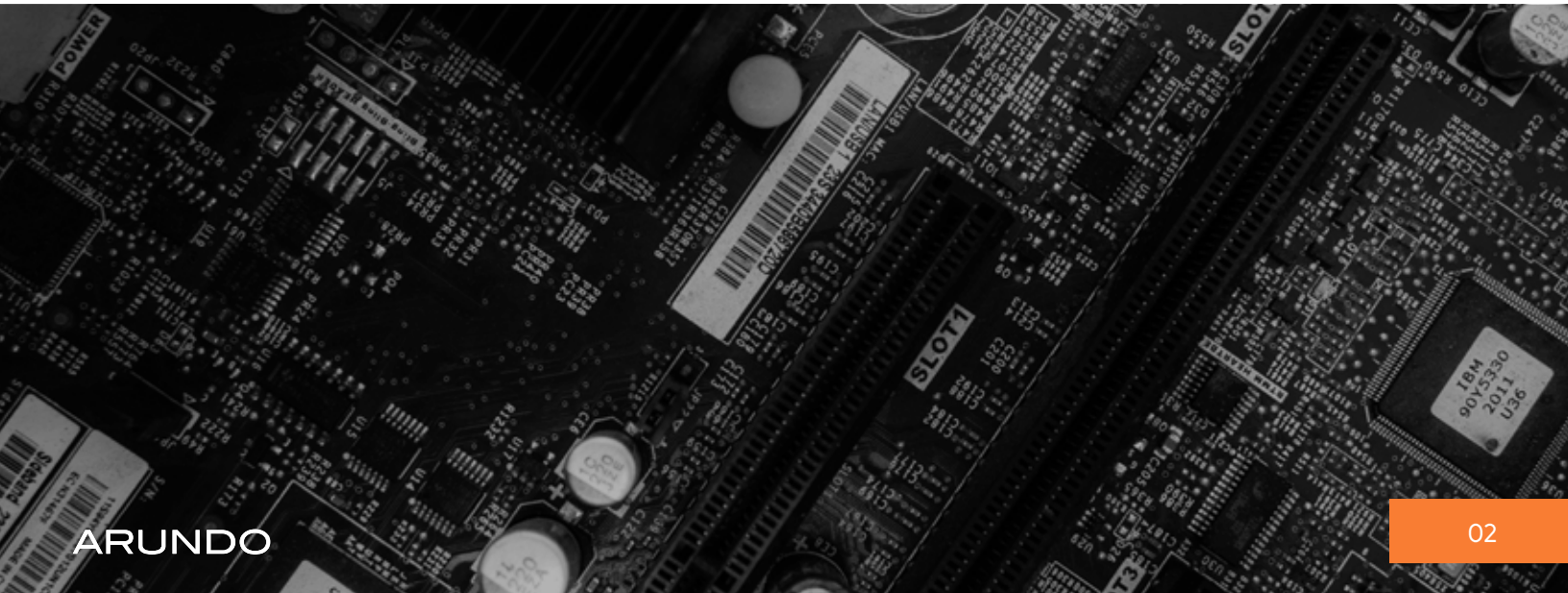

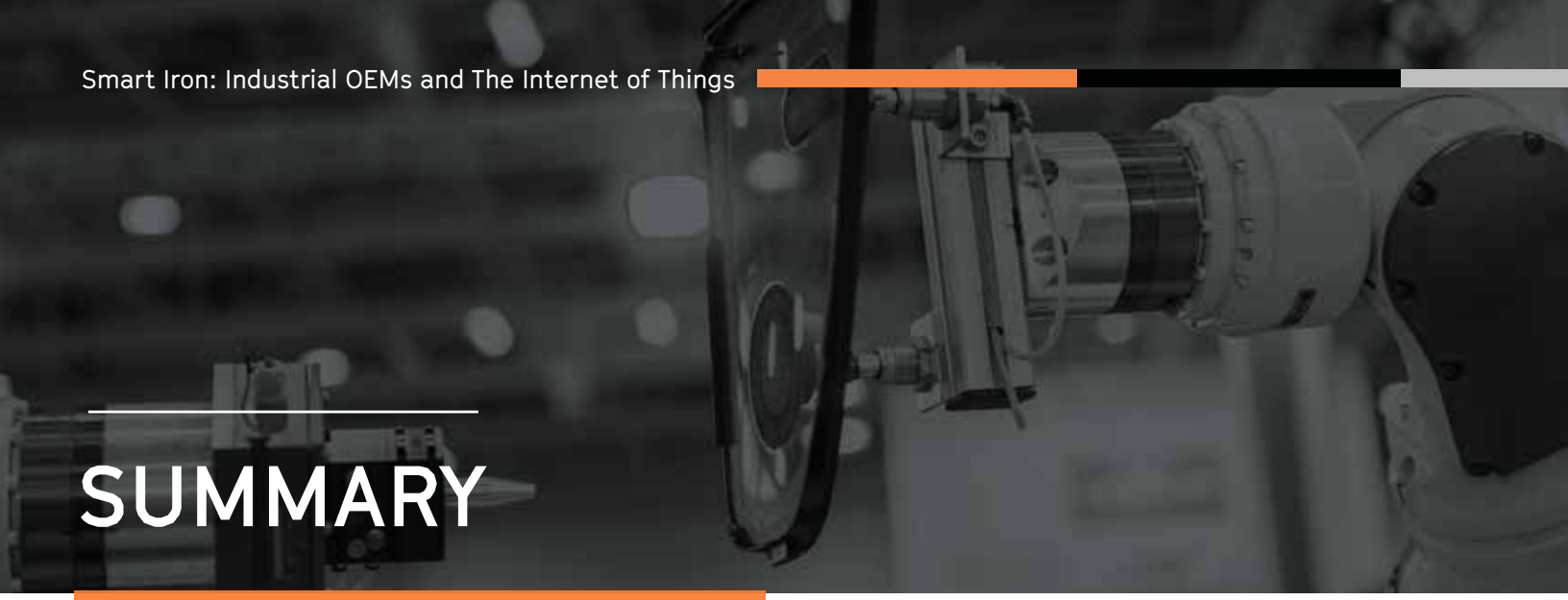

SUMMARY

The convergence of several long-term technology trends enables unprecedented insight into physical asset performance:

- Reduced costs for data generation, storage and compute
- Ubiquitous connectivity (even if not yet persistent)
- A growing set of sophisticated machine learning and other analytical methods to apply to rapidly proliferating data sets

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As a consequence, users of heavy industrial equipment are starting to demand that OEMs provide enhanced insight into equipment, and otherwise help unlock value from new data.

OEMs that do not provide such digital capabilities may face substantial risks to their business in coming years, including:
Exclusion from procurement processes that demand a minimum digital bar even for heavy.

- Equipment such as pumps, compressors, or heat exchangers, and
- Loss of market share to competitors with integrated digital solutions.

OEMs must extend their expertise in software, data science, and in some cases, business process management, or partner with trusted 3rd parties to provide such expertise, in order to meet emerging customer needs.

Successful OEMs will not only satisfy current customer demand, but find that they have opportunities to selectively reshape their business models, securing both new and more recurrent revenue.

THE CHANGING DATA LANDSCAPE IS TRANSFORMING INDUSTRIAL EQUIPMENT

Leading companies in heavy industries – operators and suppliers in energy, maritime, utilities, chemicals, and other capital-intensive operations –are reshaping their approach to operating performance in response to the convergence of several long-term technology trends:

- Data storage and processing capacity are effectively unlimited and almost free at the margin.
- Sensors continue to decline in cost and physical footprint.
- External data sources continue to proliferate.
- Sensor, device, and asset-level connectivity continue to improve in quality and cost.
- Machine learning tools and techniques are increasingly accessible.

This intersection of device connectivity, data storage, and compute capability is often referred to as the Internet of Things (IoT). For industrial companies, the ability to interact with physical equipment has never been greater. Companies now have the ability to access and analyze a previously unimaginable amount of data, arriving almost constantly from a variety of sources, and to make meaningful business decisions from this data continuously.

Industry leaders are taking advantage of this ability to increase revenue, decrease costs, and to create new business models. However, most companies are just beginning their digital transformation – they typically access, analyze, and make decisions based on just a tiny fraction of the potential data generated from their assets and equipment.

Table 1. The Changing Data Landscape for Industrial Businesses

	Legacy system design constraints	Industrial the Internet of Things potential system capabilities
Size of datasets generated	Megabytes to gigabytes	Terabytes to petabytes
Timing of data availability	Weekly or daily batches	Near real-time to real-time streaming
Typical analytical approach	Periodic asset-level optimization with linear programming models	Continuous system-wide predictions and optimization with machine learning models
Decision-making integration	Periodic reports; dashboards	Real-time alerts; continuous process feedback

Every industrial company must come to terms with the emerging data landscape created by the Industrial Internet of Things (IIoT). Already, many asset owners and operators are “sensoring up” their physical operations – even before finalizing the new business strategies, operating processes, and software tools required to realize value from new digital assets and data streams.

OEMS SUPPLYING HEAVY INDUSTRIES MUST INNOVATE AND ADAPT IN THIS NEW DATA LANDSCAPE

The CEO of a leading oil company recently stated that his company prefers equipment suppliers that enable enhanced insight into physical assets; all else equal, equipment with more sensors and analytical capabilities will be selected.

This sentiment is increasingly common across asset-intensive industries, and major OEMs have invested significantly to increase the data generation, acquisition, communication, and analytical capabilities of their major physical product lines.

For instance, the first blowout preventer (BOP) for oil rigs was invented almost one hundred years ago. Such devices safeguard many human lives and enormous capital investments, yet have operated on largely similar principles for decades. Certain major suppliers of pressure control equipment now provide digital condition-based monitoring (CBM) systems for blowout preventers. This system combines sensors, local data storage, and communication systems with standard physical equipment, and is intended to reduce maintenance costs and failure risks. Such a bundled digital/physical solution represents a significant development in the history of this equipment. In coming years, such CBM systems are likely to be deployed wherever important pieces of equipment may be found.

In fact, in the last year major OEMs have completed significant deals wherein they continue to own the BOP system and simply offer “pressure control by the hour” as a service. Such transaction structures reduce the capital investment and financing requirements of the end customer, with OEM performance metrics tied to back-end servicing of the equipment. This type of outsourcing structure has been common in information technology for decades, but due to IIoT system capabilities, is now starting to permeate heavy industry. Independent of the financing element of this type of transaction, which in many cases will be a function of vendor balance sheet scale, execution – particularly profitable execution – of these types of deals will only be possible through a comprehensive digital management capability. Suppliers without such a capability will be significantly disadvataged in competing with more digitally savvy OEMs, and perhaps even exclued from consideration in future procurement processes by end customers.

HOW WILL SMALLER OEMS COMPETE IN THIS NEW ENVIRONMENT?

The critical driver of the new data landscape is the significantly lower – and rapidly decreasing – cost of data acquisition, communication, storage and processing. Smaller companies are not disadvantaged vis-a-vis their larger competitors in this respect. However, many OEMs, large or small, may lack deep experience in one or more of the three primary ingredients required to provide meaningful value in the new data landscape:

- Software expertise to access and process massive volumes of data, including messy, unstructured historical or external data sources
- Data science expertise in large-scale modeling and machine learning to analyze such massive volumes of data
- Business process understanding to make better, faster decisions from a constant stream of new information

Without these capabilities, companies will not be able to generate meaningful insights from the torrent of new data, or create value from such insights as they constantly update.

Many OEMs, especially smaller companies, may view areas such as software development and data science as far outside of their standard knowledge base and skill set. In order to thrive, some will need to integrate strong 3rd party offerings, even as they work to upgrade their internal capabilities.

NEW DIGITAL CAPABILITIES ENABLE OEMS TO BETTER SERVE CUSTOMERS AND INNOVATE THEIR BUSINESS MODELS

For instance, a privately-held European manufacturer of critical pumping equipment for oil & gas and other applications worked with Arundo to integrate streaming data analytics into its standard pumps.

With multiple sensors on each pump measuring temperature, vibration, torque, and other key conditions, the integrated system uses advanced analytics to create real-time visibility into underlying asset conditions, enabling CBM. In partnering with Arundo, a leading specialist in the fields of data science and software development, this manufacturer is able to create a novel capability – the ability to sell "pumping" as a solution, in addition to pumps as a product. This flexibility and nimbleness allows the company to support its global customers as they proceed on their own digital journeys.

DIGITAL CAPABILITIES CREATE IMMEDIATE AND LONG-TERM VALUE FOR CUSTOMERS

This pump CBM system reduces unplanned downtime by alerting users to anomalies that typically lead to unexpected failure far ahead of normal diagnostics.

This visibility reduces ongoing maintenance costs, by extending the interval between planned maintenance downtime to account for varying field conditions and usage rates. The CBM system integrates live signal data from pump sensors with historical signal data, test data, maintenance data, failure notifications, work orders, and other vendor interactions, to create sophisticated predictive models.

The applications from such data are not limited merely to individual pumps. The data streams create transparency into the entire local network of pumps in a field, including conditions up-stream and downstream of each individual pump. This allows insight into local equipment conditions and field operations beyond those of the pumps themselves.

THESE CAPABILITIES CREATE A FOUNDATION FOR EVEN GREATER VALUE OVER TIME

These applications extend beyond a single network of pumps in one location. The pump-level information in one location could be compared across a global fleet of similar pumps deployed in other locations, improving the accuracy of local signal data in anomaly detection and creating greater understanding of local effects in any specific location. This global fleet-level modeling is a cutting edge area of data science where Arundo has filed patents.

Over time, as signals drift and local conditions change, predictive models must be updated to understand how to react to changes in potentially anomalous patterns.

Arundo is pioneering "adaptive learning" models – a leading area in machine learning – that automatically account for changes in underlying signals while maintaining the accuracy of predictions.

WINNING OEMS WILL COMBINE THEIR DEEP CLIENT RELATIONSHIPS AND PROVEN EXPERTISE WITH DIGITAL SOLUTIONS AND DATA SCIENCE AS QUICKLY AS POSSIBLE

Since at least the 1980s, successive waves of global forces, new technology, and resulting best practices have permeated heavy industry with varying degrees of rapidity.

The Industrial Internet of Things increases the transparency, auditability, and velocity of business data and decision-making.

The resulting wave of digital transformation is already changing how heavy industries behave. In the aircraft industry, for instance, major engine manufacturers have been selling "thrust per hour" rather than engines for many years. The commercial model focuses around managed services contracts relying on a combination of smart iron with the related software and sensors tied to maintenance teams providing constant attention.
These types of approaches are spreading throughout other heavy industries as IIoT capabilities take hold.

Industrial companies that adapt most quickly to this new environment are likely to significantly lead their slower competitors in a world that may look increasingly like the "winner takes all" landscape of some technology-driven markets. Industrial leaders are already investing heavily to create such separation. OEMs that supply these companies face similar choices: adapt or face stiffening headwinds.

For OEMs considering 3rd party support to improve data science and software competencies and to speed time-to-market for digital offerings, partnerships with "pure play" technology providers – rather than large equipment manufacturers with related digital businesses – are likely to prove most attractive. Such pure play companies do not create the complications from potential channel conflicts, or concerns over intellectual property, that may arise if an OEM adopts a software platform that is sold by a competing hardware sales force.

AUTHORS

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ABOUT ARUNDO

With offices in Oslo, Houston and Silicon Valley, Arundo Analytics provides cloud-based and edge-enabled software for the deployment and management of enterprise-scale industrial data science solutions. Arundo's software allows industrial companies and other organizations to increase revenue, reduce costs and mitigate risks through machine learning and other analytical solutions that connect industrial data to advanced models and connect model insights to business decisions.

In 2016, Arundo graduated from Stanford University's StartX accelerator program, and subsequently received investment from the Stanford-StartX Fund. In 2017, Arundo was named to the MIT STEX25 by the Massachusetts Institute of Technology Startup Exchange (MIT STEX). MIT STEX25 recognizes select companies from a pool of more than 1,000 MIT-connected startups as being particularly well-suited for industry collaboration based on technical and commercial success.

For more information, please visit www.arundo.com, or follow Arundo Analytics on Twitter https://twitter.com/arundoanalytics

If you would like to explore opportunities to integrate advanced machine learning and large-scale data science software capabilities into your industrial products, please contact us.

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