ARC STRATEGIES

By Chantal Polsonetti

Industrial Internet of Things Survey Results Part 1: Motivations and Expectations

ARC
Advisory Group

VISION, EXPERIENCE, ANSWERS FOR INDUSTRY

Chart 1: Benefits of Asset Management

Benefit	Currently	In 2 Years	In 5 Years
Reduced machine or asset downtime	61%	31%	14%
Improved asset utilization/RoA	39%	37%	15%
Reduced machine or asset lifecycle costs	39%	36%	16%
Improved process performance	44%	40%	21%
Improved personnel productivity	39%	40%	17%
More rapid service response	51%	34%	16%
Opportunity for business innovation	30%	36%	24%
Ability to sell or buy products as a service	26%	28%	16%

Legend: Currently, In 2 Years, In 5 Years
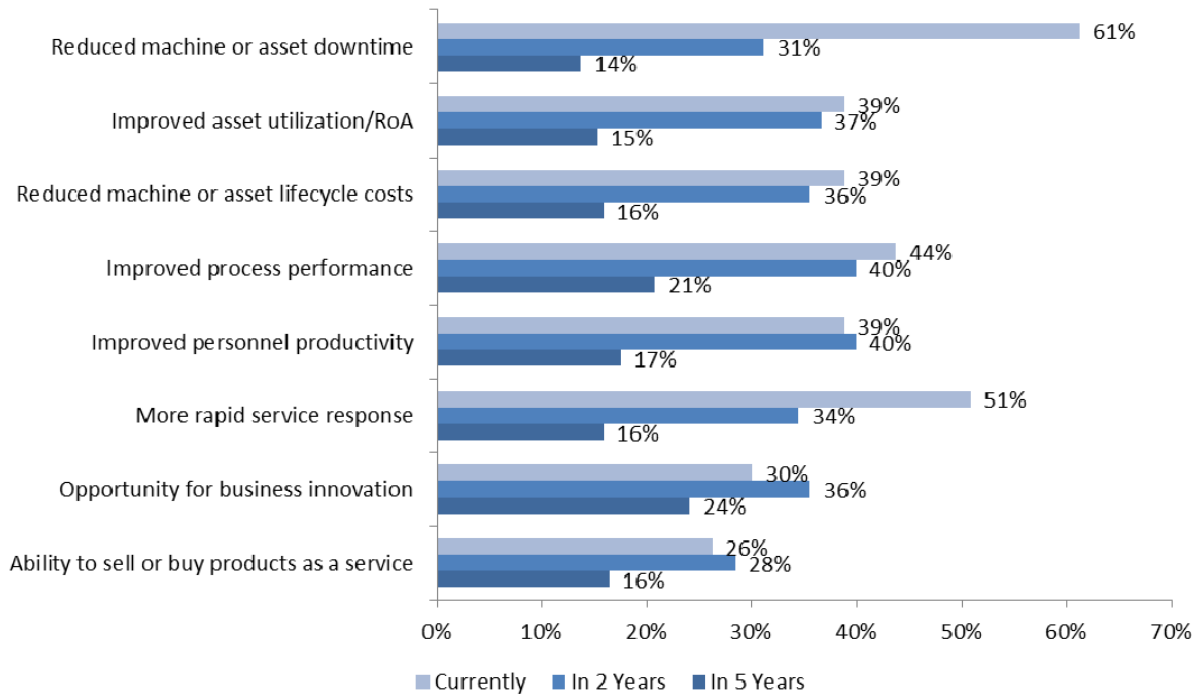
**Reduced Machine or Asset Downtime Remains a Leading Driver;
But Process, Personnel, and Service Improvements Also Important**

Chart 2: Obstacles

Obstacle	Percent
Security concerns	59%
Unclear financial benefit	51%
Unrecognized business value	47%
Budget contraints	45%
Lack of technology standardization	44%
IT resources lacking	41%
No or limited executive support	34%
No upgrades or new installations planned	20%
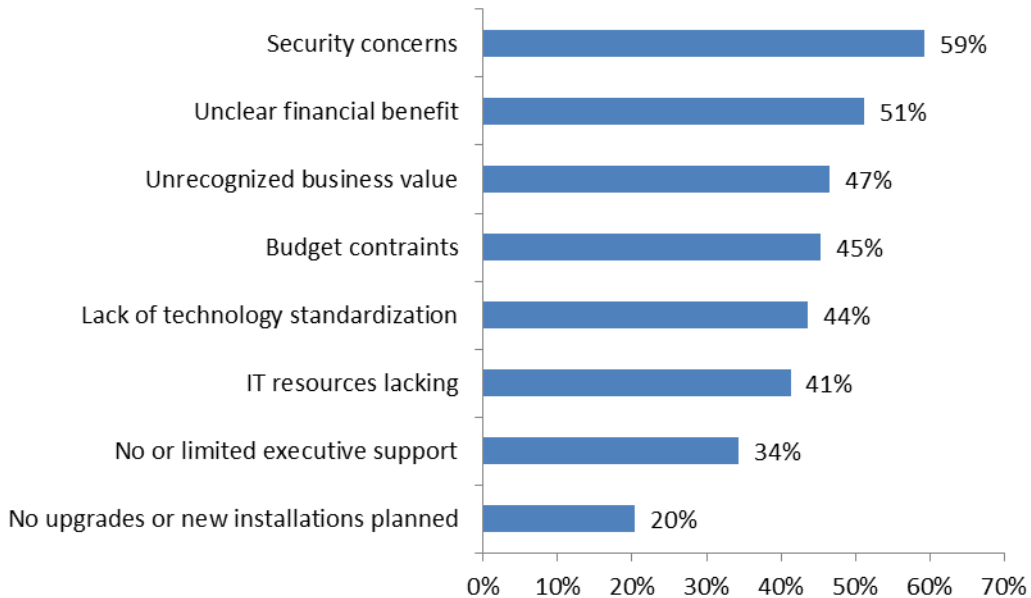
**Security Concerns and Financial and Organization Obstacles
Are Paramount**

Executive Overview

Will the Industrial Internet of Things (IoT) turn out to be the next big revolution in manufacturing? Information from IoT-connected devices promises to lower costs, optimize processes, and provide a platform for business innovation; but concerns about security and standardization could stand in its way.

Early in 2014, ARC and *Automation World* magazine conducted a web survey on IoT adoption. We received more than 200 responses from a variety of industry participants. The results reflect the anticipated benefits of IoT adoption in areas ranging from reduced machine uptime to new service opportunities as well as the security, financial, and organizational obstacles that may stand in its way. A separate Part 2 of this report will cover specific details of planned implementations.

ARC Advisory Group, in conjunction with *Automation World* magazine, conducted a short web survey in the first half of 2014 to gauge the industry's perspective on this current hot topic. The survey was part of ARC's multi-faceted research into the impact of the IoT on manufacturers.

Over 200 respondents participated, including current and potential end users, system integrators, OEMs, and providers. Respondents covered numerous manufacturing industries, with machinery manufacture and food and beverage, which also has numerous process and packaging machine types, as the lead representatives. A number of respondents serving continuous process industries also participated, reflecting the widespread interest and numerous potential applications for this technology.

In Part 1 of this report we primarily cover big picture items, such as drivers, inhibitors, and related factors impacting IoT adoption. In Part 2, we will cover more of the "brass tacks," or basics, of potential IoT implementations.

While any web survey is subject to the particulars of respondent self-selection (the phenomenon in which people tend to answer questions on topics that interest them), these results clearly indicate that manufacturers and other industrial organizations are seriously looking at the IoT and what it can do for them. The results also reflect an anticipated migration from the initial benefits of remote monitoring and predictive maintenance in reducing machine downtime, to potential business innovations in areas such as product as a service.

Concerns about security remain a primary obstacle, as do organizational issues and determining actual business value. These imply the need for greater education into the value of the IoT for those who might benefit.

ARC Definition of the Industrial Internet of Things

ARC Advisory Group defines the industrial Internet of Things (IoT) as connecting intelligent physical entities, such as sensors, devices, machines, assets, and products, to each other, to internet services, and to applications. The industrial IoT architecture builds upon current and emerging technologies such as mobile and intelligent devices, wired and wireless networks, cloud computing, Big Data, analytics, and visualization tools.
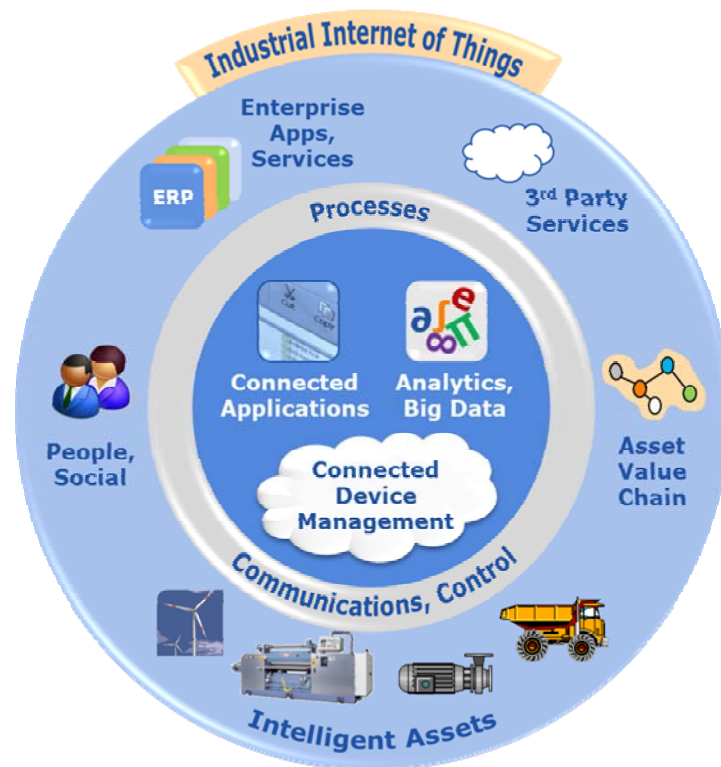
ARC's Industrial Internet of Things Model

With most of the technological components already available, concerns over cyber security, technology standardization, and intellectual property ownership remain the most prominent potential obstacles to IoT adoption. Many of the respondents to our 2014 IoT survey echoed these same concerns.
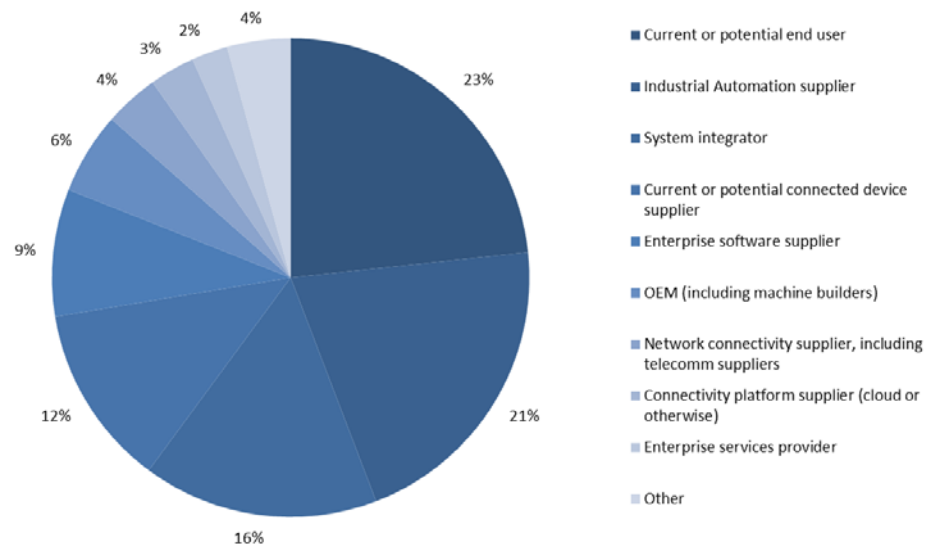
Survey Objectives and Respondents

ARC, in conjunction with *Automation World* magazine, conducted a short web survey in the second quarter of 2014 to gauge the industry's perspective on prospects for adoption of the Industrial Internet of Things. This survey is part of ARC's multi-faceted research into the impact of the IoT on manufacturers.

Among other objectives, the survey aimed to provide insight into current and projected use of internet-connected devices, level of enterprise integration for connected devices, and potential drivers and inhibitors impacting IoT adoption. Most questions asked respondents to indicate what was currently employed versus what they planned to deploy in two to five years.

Respondents by Type

Responses were encouraged from both current and potential users of IoT solutions as well as providers, who are asked to answer the survey from the perspective of the solution type they offer. Given the industrial emphasis of the research, responses were solicited via an *Automation World* direct mail campaign, ARC's ARCwire newsletter and web site placement, and via the ARC Industrial Internet of Things group on LinkedIn. A total of 216 responses were received, although not all respondents answered every question.
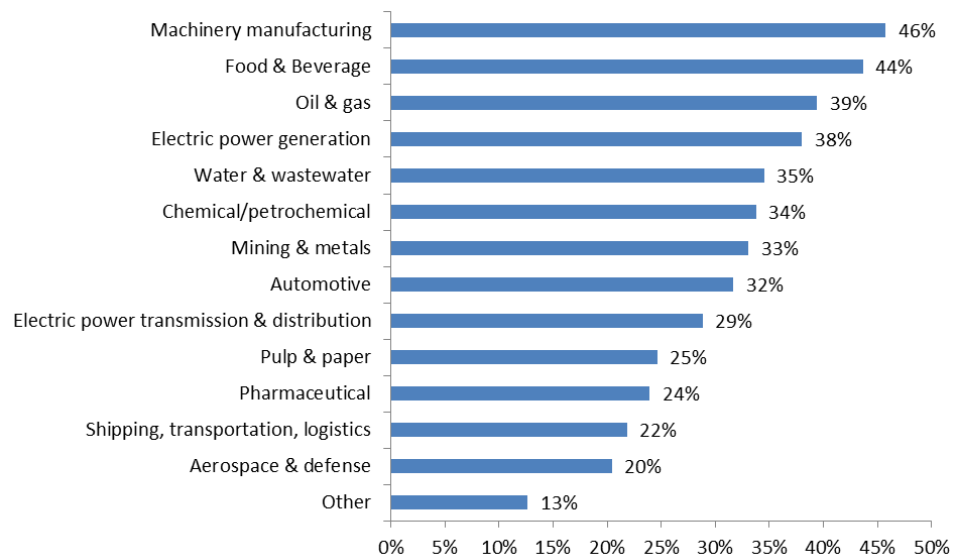

Pie chart values: 23%, 21%, 16%, 12%, 9%, 6%, 4%, 3%, 2%, 4%

Legend:
- Current or potential end user
- Industrial Automation supplier
- System integrator
- Current or potential connected device supplier
- Enterprise software supplier
- OEM (including machine builders)
- Network connectivity supplier, including telecomm suppliers
- Connectivity platform supplier (cloud or otherwise)
- Enterprise services provider
- Other

Current or Potential End Users Accounted for Close to One Quarter of Respondents, Followed by Industrial Automation Suppliers and SIs

Respondents by Industry

Respondents were also asked to indicate in which manufacturing industries they were currently installing or planned to install IoT solutions. Multiple replies were allowed to enable integrators, OEMs, and providers to indicate their primary industries served.

Machinery manufacturing emerged as the lead category, followed closely by food & beverage, which also has a large machinery component for both processing and packaging. Interestingly, the continuous process industries were also strongly represented; with oil & gas, electric power generation, water & wastewater, and chem/petrochem each accounting for over 30 percent.

Respondents in the "other" category were drawn largely from the building automation industry. Medical devices, animal tracking, and civil infrastructure were also represented.

Industry	Percentage
Machinery manufacturing	46%
Food & Beverage	44%
Oil & gas	39%
Electric power generation	38%
Water & wastewater	35%
Chemical/petrochemical	34%
Mining & metals	33%
Automotive	32%
Electric power transmission & distribution	29%
Pulp & paper	25%
Pharmaceutical	24%
Shipping, transportation, logistics	22%
Aerospace & defense	20%
Other	13%

Multiple Responses Were Allowed Regarding Industries Served in Order to Accommodate OEMs, Integrators, and Suppliers

Business Drivers Fueling IoT Adoption

Industrial firms have long pursued horizontal and vertical connectivity in their ongoing efforts to improve performance and achieve operational excellence. Reduced machine downtime, particularly unplanned downtime, is

a primary initial driver behind anticipated IoT adoption. Ability to improve this metric provides real business value that can help industrial organizations justify adoption of the IoT and connected devices.

The survey results reflect these drivers, with over 60 percent of respondents citing reduced machine or asset downtime as a primary driver for considering an IoT solution. Use of IoT-based solutions to improve overall asset utilization, improve process performance and personnel productivity, and achieve more rapid service response were also high on the list of primary business drivers behind IoT adoption. Some responses reflected a more global view, forecasting that the IoT would have impact across entire operations.

> Reduced machine downtime and improved asset utilization were cited as leading drivers behind IoT adoption, but respondents' future vision included improved process and personnel productivity and, ultimately, the opportunity for business innovation.

From a timeline perspective, it is interesting to note that reduced downtime and improved service response times were most often cited as current drivers, with improvements in process and personnel productivity as more mid-term motivations. Similarly, the opportunity for business innovation as a potential IoT driver tended to fall more in the two to five year timeframe. This is a higher order driver, but with further out anticipated benefit and one that was not frequently cited as a primary justification for adopting the IoT.
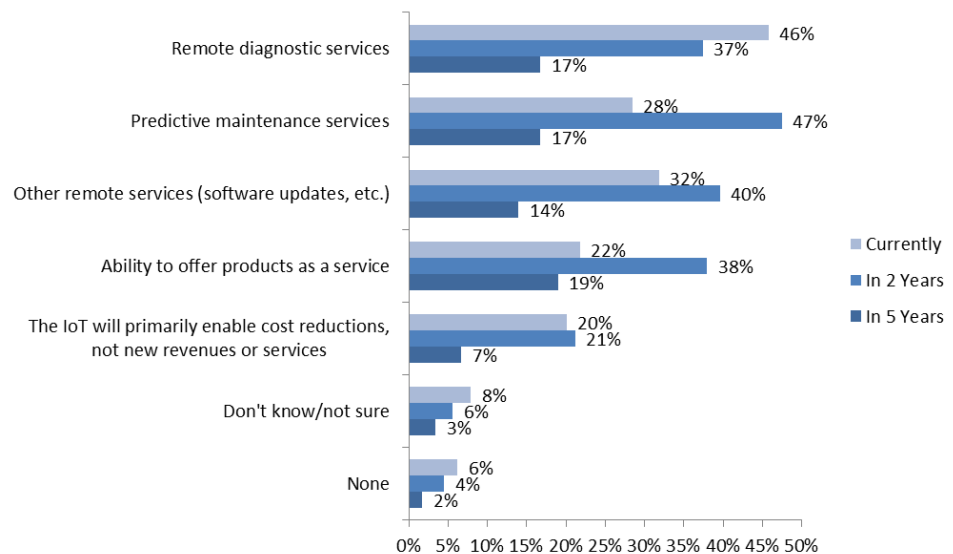
Potential for New Service Offerings

Ability to offer or consume new service offerings is one of the potential incremental benefits associated with industrial IoT adoption. A number of suppliers already offer remote diagnostic capabilities, but in many instances these operate off-line, often as a batch processing operation connected via point-to-point. In our survey group, which included suppliers and other providers as well as end users, close to one-half currently employ remote diagnostic services.

Of greater interest as far as IoT adoption is concerned are the numerous responses, even in the two-year time frame, where higher-level service offerings are anticipated. These include predictive maintenance services, which are directly tied to reduced asset downtime, as well as adding incremental remote service offerings that leverage the IoT infrastructure. The

survey results indicate that both suppliers and users envision a time in the near future when more and more updates, maintenance services, and process improvement tools will be delivered and/or executed remotely.

Another interesting finding is that, while ability to offer products as a service ranked in the lower tier of general business factors driving IoT adoption, it ranked much higher in terms of potential new services enabled by the technology. In the industrial world, this typically translates to selling the service provided by given equipment on a subscription basis rather than simply selling the equipment itself. One of the more prominent examples of this in recent industry IoT discussions are GE's comments that the IoT could enable the company to bill airlines on the basis of thrust delivered, versus just selling them jet engines.

Survey Respondents Indicated Definite Interest in New Service Offerings Enabled by the IoT

Potential Inhibitors to IoT Adoption

Most people who follow manufacturing technology know that concerns about the security integrity of the industrial IoT and connected devices pose the greatest threat to widespread adoption. This was also clear from the survey results, with close to 60 percent of respondents citing security concerns as a primary impediment to IoT adoption.

Manufacturer concerns about IoT security frequently stem from the universal connectivity inherent in the IoT, reliance on internet technology (including cloud platforms and commercial networks), and concerns about publicized breaches of internet-based solutions. Security issues also threaten to undermine the primary value proposition of reduced unplanned downtime, particularly when minimizing process disruptions is the objective.

> We anticipated concerns over IoT security; but the need for more education as to business value and executive and organizational buy-in was also apparent.

Most industrial practitioners are very much aware of the need to cost justify new initiatives and the survey responses reflected this. A large number of respondents cited potential inhibitors such as unclear financial benefit and budget constraints, but similar responses in areas such as "Organization doesn't recognize business value," or "No or limited executive support," indicate the need for further market education.

Recommendations

In this, Part 1 of a two-part ARC Strategy Report, we focused on presenting the results of an industry survey intended to gauge prospects for industrial IoT adoption. The results are revealing in that they show that users, suppliers, OEMs, and system integrators are looking at the IoT to solve concrete business problems now, and provide incremental business opportunities in the future.

The results also show a need for further education and analysis to achieve the business justifications and sound value propositions necessary to win executive buy-in and customer adoption. Industrial organizations need to assemble sound arguments for both internal and external presentation in order to prepare for IoT adoption and achieve competitive advantage via first-mover positioning.

Evaluation of these survey results shows a clear path to that end. Many installations start with remote maintenance or service management applications, which then expand to predictive maintenance and other higher-level service offerings. While ability to offer products as a service was not evidenced as a primary driver, it is obvious that product manufacturers are looking as this possibility as a logical ultimate outcome of IoT infrastructure development.

Part 2 of this two-part Strategy Report will drill down on the specifics of anticipated installations as reported by the survey respondents. Look to Part 2 for further insights into anticipated IoT architectural components such as device types, networks, served applications, organizational issues, and supplier selection considerations.

Analyst: Chantal Polsonetti

Editor: Paul Miller

Distribution: MAS and EAS Clients

Acronym Reference: For a complete list of industry acronyms, please refer to www.arcweb.com/research/pages/industry-terms-and-abbreviations.aspx.

BPM	Business Process Management	**OEM**	Original Equipment Manufacturer
CMM	Collaborative Management Model	**PAS**	Process Automation System
CPG	Consumer Packaged Goods	**PLC**	Programmable Logic Controller
ERP	Enterprise Resource Planning	**PLM**	Product Lifecycle Management
IoT	Internet of Things	**ROA**	Return on Assets
IT	Information Technology	**SI**	System Integrator