

Enterprise Technology Outlook

Five technologies set the foundation for industrial enterprise digitalization

What managers and execs believe about connecting people, data, and machines for business transformation

By Kevin Parker

As sentient beings, we can know two things: that something is or what something is. These days, however, knowing anything requires differentiating hype from reality.

To better understand the reality of the industrial internet of things (IIoT) and cloud computing in the industrial enterprise, CFE Media, in the first quarter of 2018, conducted an SAP-sponsored survey of its readership as to its current and planned implementation of IIoT and cloud.

The survey found that:

- 73% of respondents' companies are investing in the industrial internet of things.
- 72% of respondents' companies are investing in cloud for data management, in both plant operations and the business enterprise.
- Engineering and IT staff are focused on enhanced connectivity and better networking, while corporate entities and local executive management are planning to exploit connectivity for enhanced application of analytics, simulation, and modeling, supported by cloud modalities.

IIoT brings together advances in edge control, ubiquitous connectivity, and analytics. Cloud computing is a model for

About 78% of respondents, or their clients, are automating data transmission from the supply chain to ERP.

enabling on-demand network access to a shared pool of configurable computing resources, delivered as a service.

The survey results highlight the progress being made. One of the most telling data points is that while only 14% of respondents said they have implemented cloud computing for improved productivity, fully 39% say they currently have cloud implementations in progress.

In addition, while the initial IIoT focus in manufacturing industries was on plant floors, it is increasingly clear that its

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Automating data from supply chain to ERP system?



Need for best practices recognized

Start with productivity gain, go on to new business models

The Industrial Internet of Things (IIoT) and cloud are already positively impacting production and supply-chain operations, indicate respondents to a recent CFE Media survey sponsored by SAP.

While technicians and engineers work for connectivity-driven productivity gain, in a growing number of cases, managers and executives are using the evolving IT-based automation infrastructure to drive the process change that makes new business models possible, the survey results say.

More than half of survey respondents feel that networking (60%) and machine-to-machine connectivity (49%) are closely associated with IIoT productivity improvements. At the same time, fully 78% of respondents say they are investing to automate data or information transmission from the production plant or supply chain to their enterprise (ERP) systems. Such a unified system can lay the foundation for digitalization by standardizing best practices across business models.

It's not just about ERP, however. In an astute observation, fully 57% of the equipment or machine providers taking the survey saw as essential the availability of IIoT data taken from manufacturing execution systems (MES), to increase productivity and develop new business models.

Situated between the plant-floor supervisory control and business-enterprise ERP systems, MES can include support for shop-floor control, lean manufacturing,

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consequences at the business enterprise level will be, at the least, equally profound.

In the enterprise

As is well known, enterprise resources planning (ERP) is a suite of software applications that manufacturers use for integrated management of core business processes, including finance and human resources, based on common process and data models. It is the enterprise system *par excellence*. In manufacturing industries, up-to-date, integrated ERP data allows quick response to changing market conditions and business needs.

In the emerging digitalization paradigm, with process control running at the edge, ERP becomes the potential aggregation point for all kinds of data, and not just the transaction data that describes events such as orders, invoices, and payments. With an in-memory database and next-generation ERP system like SAP's S/4HANA, possibilities for gleaning truth from data are brought to light.

For example, one of SAP S/4HANA's latest advances is the introduction of a geographic information systems (GIS) capability, but not just as an application feature. A single in-memory database runs the business applications and the GIS. In one case use, for example, a company benefits from a preventive maintenance application that combines transactional data from the SAP ERP central component with both geospatial and machine data.

When it comes to IIoT and cloud investment, manufacturers are ahead of most other industries, with spending estimated at \$183 billion in 2017 alone, according to IDC. Most of the money manufacturers

spend is earmarked for projects to improve production and supply-chain operations.

"Leading companies are most certainly aware of IIoT's emergence," says David Parrish, SAP senior global marketing director for the automotive, industrial, and components sectors, "and continuing innovation has stirred action. The analysis of large data sets brings with it the ability to monetize that data and drive thriving new business models. The result is that more and more companies are doing something significant in regard to digitalization of their operations. How much they're doing is largely dependent on the IT group's sophistication, or how driven the operations people are about leveraging the tremendous opportunities for transforming business processes in the age of digitalization."

SAP, best known as the market leader in enterprise application software worldwide, sees five trend categories as pertinent to what manufacturers want to achieve. These include:

- smart digital products equipped with IIoT and edge intelligence
- increased productivity, including use of digital twins and augmented reality
- customer centricity, including pay-for-use, smart products, aftermarket service, and software-laden products
- smart factory and digital supply chain, including plug-and-produce flexibility and machine learning
- servitization and new business models, including industry networks, smart products, pay-for-consumption, and increased services.

In these complex environments, Parrish says, a core enterprise system will serve as

both connectivity and analytic engine, and with in-memory processing, allow manufacturers to comprehensively benefit from IIoT data.

In the future

At this point, per the CFE survey, while a total of 73% of respondents said they're investing in IIoT, 48% said they're investing in greater use of cloud for data management within process control and data applications, and 44% said they're looking to make that data available to ERP systems.

Supervisory control and data acquisition (SCADA) systems support technicians and engineers managing automated processes in industrial settings. The application of IIoT sensing and control functions in process control and discrete manufacturing typically involves serial data, often transmitted in milli-second intervals.

On the other hand, ERP is a transactional system with roots in materials management. Therefore, process-control data is typically aggregated prior to posting to ERP. The biggest IIoT benefit comes from adherence to emerging protocols and standards. Yet more than 55% of the survey respondents associate the productivity gain based on IIoT with SCADA, data historians, and human-machine interfaces.

Today, an ERP system's manufacturing module combines manufacturing execution with manufacturing intelligence. (See accompanying article, "Need for best practices recognized.")

Finally, when investing in an integrated ERP system, the survey results indicate, midsize companies remain conservative in that their primary goals are to improve technology & data (64%), organizational structure (42%), raw materials & vendor management (41%), and organic growth & product development (41%).

Emerging narrative

IIoT has three aspects: sensing and control at the edge; connectivity and collaboration; and enterprise analytics. What the survey reveals is a landscape in which these aspects tend to evolve separately. The

Respondents say they're investing in IIoT and cloud for production environments and the business enterprise.

Five technology trends

Industry veterans tell it like it is

Survey objective and methodology

The study was conducted by CFE Media to gauge end users' understanding and usage of enterprise resources planning (ERP), the industrial internet of things (IIoT), and digital computing modalities.

The survey sample was selected from subscribers to CFE Media print and digital publications, including *Control Engineering* and *Plant Engineering*,

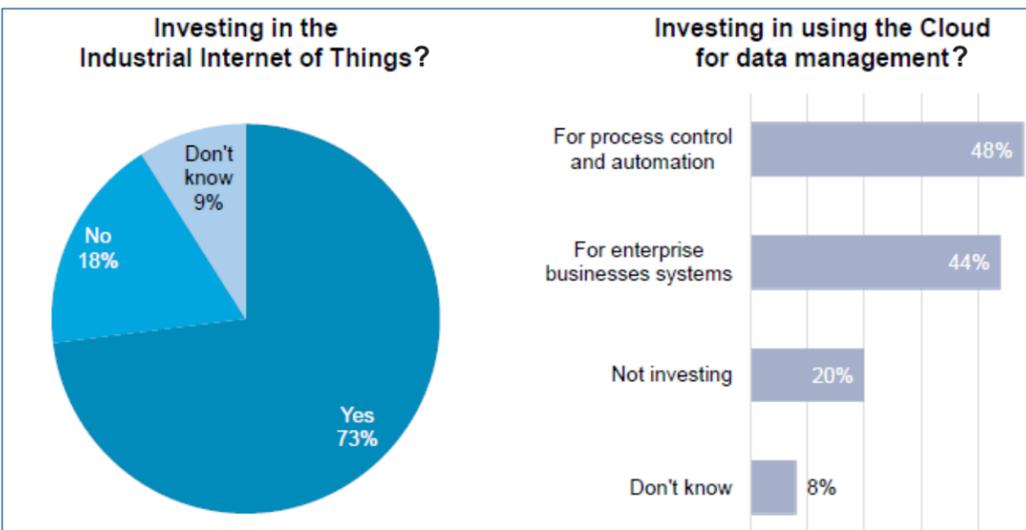
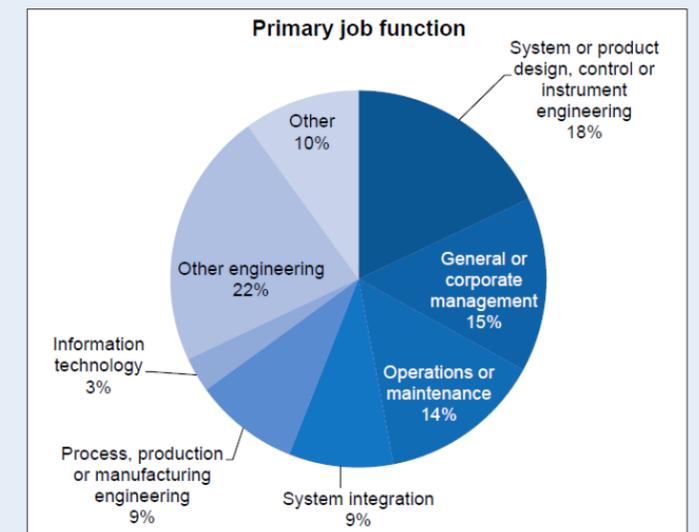
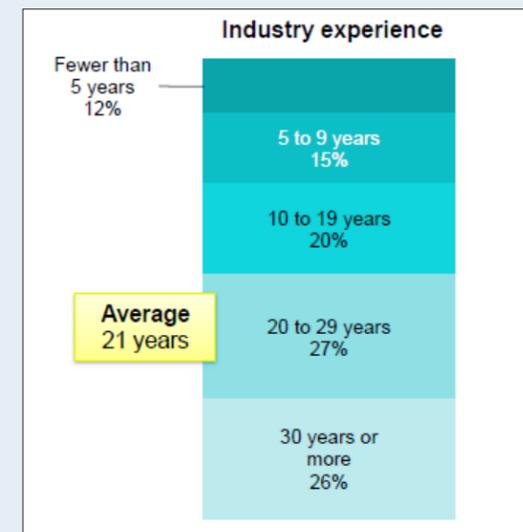
especially those investing in automation and process control; ERP or enterprise systems; or IIoT and cloud computing.

Results totaled nearly 200 qualified respondents for a margin of error of plus or minus 7.3% at a 95% confidence level. Participants were offered the opportunity to enter a drawing for a \$100 gift card.

The average age of survey respondents was 50 years old.

Eighteen percent of the respondents are primarily responsible for design, control, or instrument engineering, and respondents work in a wide range of production industries.

The average respondent has been working in an engineering related position for the past 21 years. The average facility size for the respondents is more than 380 employees. ●



divide, in fact, mirrors the often-discussed split between operations technology and information technology in the process-control and discrete-manufacturing worlds.

The survey respondents are comfortable with their SCADA, MES, and enterprise systems, but with IIoT and cloud the real productivity gain will come with the means of dealing with information in many different forms.

The SAP Cloud Platform for the Internet of Things is a solution portfolio for intelligence at the edge and automated processes at the core. The platform processes data from any kind of machine, device, sensor, or actuator—merging it with transactional data, geospatial services, and unstructured information. Data from IIoT assets and other business systems is consolidated in an in-memory system that uses predictive

and analytic capabilities to support automated decision making.

Remote device and message management services remove complexity in dealing with rapidly growing numbers of devices and kinds of devices. This also pertains to the various protocols and messaging formats used to send, receive, and store IIoT data in the persistence layer of the platform, including through application programming interfaces.

Smart data integration tools facilitate cleansing, matching, deduplication, and data profiling. Lightweight databases for edge devices capture and store data locally and synchronize to upstream systems.

Sound judgements

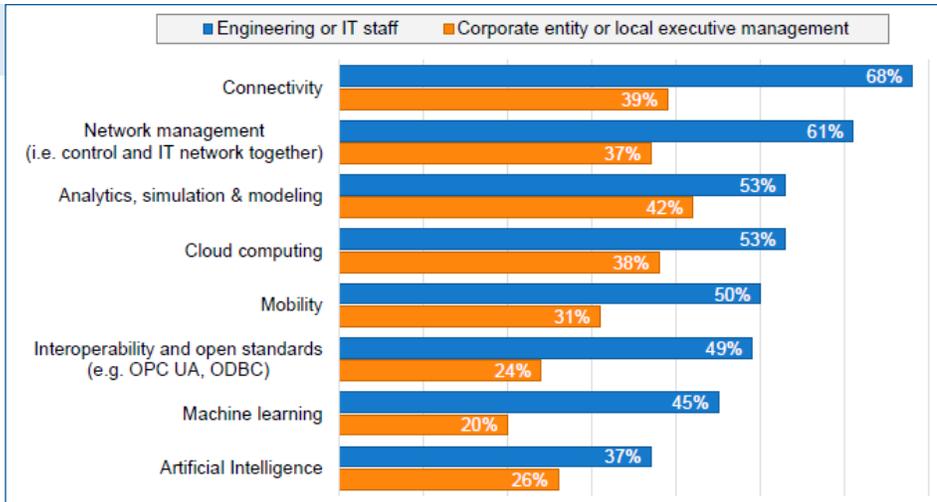
Manufacturing companies are constantly looking for better ways to integrate

Five technology trends

operations data into the enterprise to support better business decisions, and these efforts are reflected in the CFE survey results. Executives and managers are determining now their strategies for future digitalization. Based on the survey results, we might say that more and more of these managers and executives know what they don't know.

Moreover, technicians, managers, engineers, and executives have become familiar with a new lexicon that starts with networking gear like gateways and microcontrollers and ends with predictive analytics and machine learning. As technicians and engineers set the stage for extreme data availability, managers and executives are planning to make good on the promise of the information unleashed. ●

Need for best practices recognized



Engineering and IT staff are exploring or pursuing connectivity solutions, while executive management is focused on a future of analytics, simulation, and modeling.

enterprise performance management, and machine, as well as manufacturing analytics. Manufacturing Intelligence systems are a kindred technology, allowing connectivity of equipment, people, and operations to an extended supply chain.

In one recent use case example, a privately held provider of industrial ventilation equipment, including fans, dampers, ventilation, and exhausts, implemented SAP ERP and SAP Manufacturing Integration and Intelligence applications. The user reduced inventory without causing production shortages. The scalable solution, quickly extended to new plants and acquisitions, for increased productivity and better on-time delivery performance.

Service examples

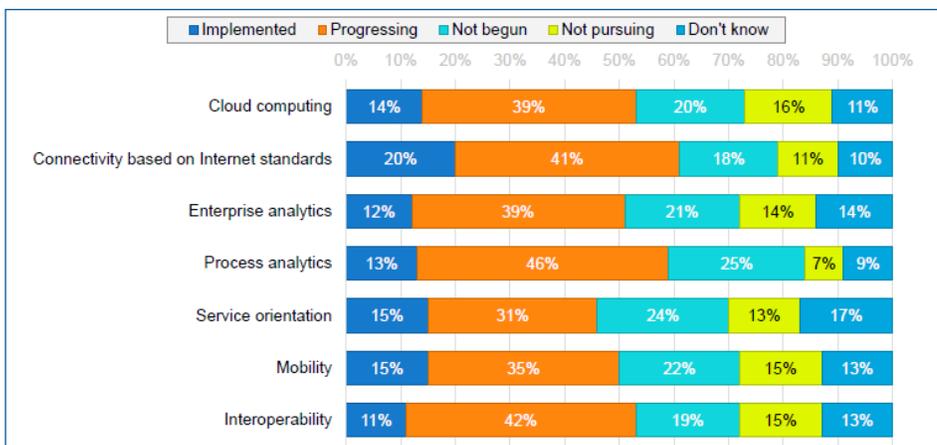
For their emerging business models to flexibly respond to changing demand patterns, industrial and other types of goods makers must have networks that convert

plant-floor data into production information, whether the systems involved include ERP, execution systems, or even SCADA. Such networks, which combine connectivity, analytics, and their management, allow manufacturers to respond to potential problems before disruptions occur, and are the true promise of IIoT.

Of the five trend categories identified—including productivity gain, customer centricity, smart products, and digital supply chain—and discussed in the previous article, perhaps the most transformational is servitization.

Servitization refers to using a company's products as the basis for a business built around a recurring, service-based revenue stream. Services delivery is an alluring prospect for manufacturers because profit margins on services are quite often higher—sometimes as much as 20% higher—than on product sales themselves. The provider enjoys quantities of scale while purchasers are willing to pay a premium for convenience and security.

More than half of the respondents have either implemented or are progressing across a range of emergent technologies.



One example is STILL, a provider of warehouse material handling products in Europe and Latin America. STILL recently equipped forklifts with sensors that respond to instructions for moving material around a warehouse. Because those instructions are delivered by a web-based warehouse management system, STILL believes it will be able to change the way it bills customers for using its forklifts.

Maker of air systems, Kaeser Compressors, harnessed IIoT technology to launch a new business called Sigma Air Utility. In the servitization model, Kaeser installs compressors in a customer's facility and uses its web-based network to track how much air the facility uses. It bills the customer only for the air used; just as electric or gas utilities bill customers for consuming energy.

"Companies like STILL and Kaeser are well along the maturity curve in showing how IIoT can transform business models," says David Parrish, SAP's senior global marketing director for the automotive, industrial, and component sectors.

Some commonalities

In all the cases cited above, IIoT-enabled devices are connecting with enterprise-level applications. For instance, STILL and Kaeser monitor the equipment deployed in their service-based businesses through modules of an ERP suite.

Other aspects of servitization include smart products, pay-for-use functionality, and increased services. Thus, the impact of these new business models extends into product development, customer management, manufacturing, and supply chain.

The challenge is that there is often the need to increase productivity, either by reducing costs or increasing throughput, even as opportunity is sought to address emerging business models and revenue streams. The respondents to the CFE Media survey are aware of this long-standing paradigm, without need of survey questions to validate it. ●

More Information

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