Industrie 4.0 addresses the digitalization of complex value chains. It is not a market; it's a vision for CIOs of future cross-industry models with a high degree of digital technologies. Successful Industrie 4.0 initiatives require efficient collaboration between enterprises, IoT TSPs and consumers.

Key Findings

- Reference models and standards defined within leading IoT consortia improve communication and collaboration between IoT TSPs and enterprise customers.
- Organizations that are not paying attention to end users' concerns for data collection, storage protection and usage will struggle to meet sales expectations.
- Industrie 4.0 has inspired nationally driven initiatives designed to digitalize the manufacturing sector and promote new business models that boost economic competitiveness.
- Algorithm marketplaces offer reusable algorithms, which help organizations speed up their development processes and cope with the transformational changes due to digital business.
- Early adopters of Industrie 4.0 are renovating their ERP solutions and integrating them with upcoming general-purpose IoT platforms.

Recommendations

CIOs building and expanding a digital business through Industrie 4.0 or IoT initiatives should:

- Participate in consortia with resources dedicated to networking and learning from others by sharing best practices.
- Address enterprise users' concerns through high levels of transparency regarding the use of IoT goods and services in their daily lives.
- Intensify collaboration with manufacturing and supply chain counterparts to dissect factory-of-the-future initiatives into their individual components and facets, with an underlying focus on "industrial productivity beyond national and consortium borders."
- Continuously check and consider offered algorithms for their usability in Industrie 4.0 projects, and create your own library of available and potentially useful algorithms.

- Initiate a modernization project to transform your ERP solutions into a solid foundation for IoT and Industrie 4.0. Do not stop at the boundaries of your enterprise.

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Strategic Planning Assumptions

By 2020, 25% of IoT platform vendors will position their solutions to align with IoT/Industrie 4.0 reference architectures, up from less than 5% in 2016.

By 2020, 30% of the organizations partnering in Industrie 4.0 initiatives will align their personal data management strategies to overcome end users' hesitations to applying IoT in their daily lives.

By 2019, half of the government-sponsored Industrie 4.0 initiatives in the manufacturing sector will fall short of delivering on expectations as a result of reduced funding.

By 2020, at least 30% of Industrie 4.0 projects will source their algorithms from leading algorithm marketplaces, up from less than 5% in 2016.

By 2020, 50% of the companies that have renovated their ERP core and migrated their IoT infrastructure to a standardized platform will increase customer interactions by over 20%.
Analysis

What You Need to Know

Industrie 4.0 goes far beyond the connection of IT applications and physical assets. Internet of Things (IoT) initiatives need to be business-driven and value-chain-driven. Digital business — especially in the context of Industrie 4.0 — is focused specifically on peer exchange and communication between business (including process and information), people and physical things as equal entities. This means that different parties need to collaborate efficiently across the whole life cycle of Industrie 4.0 initiatives.

Industrie 4.0 has been underway for more than five years, and the fourth industrial revolution is in full swing. Many companies have started Industrie 4.0 initiatives, and while the creativity in defining scenarios and use cases is impressive, and technology continues to evolve, key challenges of businesses are:

- Realizing tangible business benefits through IoT
- Ensuring the confidence and involvement of the end user
- Increasing the transparency, integration and scalability of IoT solutions by using standards and reference architectures
- Ensuring efficient collaboration with customers, vendors, partners, industry trade associations and consortia

This document describes five predictions that address different aspects of Industrie 4.0, their interrelationships for the coming three to five years and their individual impacts. It also provides actionable recommendations to ensure that Industrie 4.0 is operative and beneficial for enterprises of all sizes in different vertical industries.

Strategic Planning Assumptions

**Strategic Planning Assumption:** By 2020, 25% of IoT platform vendors will position their solutions to align with IoT/Industrie 4.0 reference architectures, up from less than 5% in 2016.

**Analysis by:** Alexander Hoeppe

**Key Findings:**

Many platform and solution vendors offer technology-driven products and services. Hence, CIOs often start pilot projects with individual, technically oriented business stakeholders, resulting in isolated pilot IoT solutions. When presenting business participants with this technology-driven and siloed approach, IT departments often experience acceptance problems, as business stakeholders may not understand how to scale these IoT pilots to meet the business outcomes on which their performance is measured.
Engaging IoT consortia can support Industrie 4.0 initiatives in all life cycle stages. Beyond networking, they provide access to — and the possibility to contribute to — standards, reference architectures, test beds, IoT use cases and benchmark information validated by multiple members from different industries and public organizations. Consortia, such as the Industrial Internet Consortium (IIC) and Plattform Industrie 4.0, join forces to define comprehensive Industrie 4.0 reference architectures and implementation approaches, allowing multiple role-based views on Industrie 4.0 regarding industries, business outcomes, value chain/business processes, physical assets and devices, and data and IT applications.

As visualized in Figure 1, reference architectures can be understood as a bridge between IoT vendors and enterprise customers. On the one hand, they support IoT vendors to align their portfolios to business processes or value chains, leading to the acceleration of their go-to-market approaches. On the other hand, enterprise customers are enabled to build their understanding and IoT skills much faster, so they can initiate/run their Industrie 4.0 programs much more efficiently, as comprehensive reference architectures allow a value-chain-driven view on IoT technology.

**Figure 1. IoT Reference Architectures Foster Business View on IoT Technology**

![Diagram of IoT Reference Architectures](Source: Gartner (January 2017))

**Market Implications:**

- IoT consortia join forces and build up comprehensive IoT reference architectures, allowing multiple integrated views on IoT regarding value chains, business processes, industries, IT/operational technology (OT) applications, data (flows) and physical assets.

- A better understanding of the relationship between a technology and service provider’s (TSP’s) product portfolio and an end user’s business environment allows sourcing decisions to be based on business and value-driven criteria, instead of being based purely on technical features.
Access to test beds provided by IoT consortia enables early end-user look-and-feel experiences, which increase acceptance and reduce hesitation to IoT and Industrie 4.0 initiatives.

Reference architectures provided by IoT consortia accelerate Industrie 4.0 initiatives throughout the full life cycle, including scoping and roadmap definition, design, prototyping, training, implementation, rollout, and governance.

Standards and reference architectures reduce complexity in terms of integration with existing IT/OT infrastructure, scalability and cross-company interoperability.

**Recommendations:**

CIOs should:

- Participate in consortia with resources dedicated to networking and learning from others by sharing best practices.
- Use IoT reference architectures that provide a comprehensive business and technology view on IoT to improve the understanding of IoT technology with reference to your own business models, value chains and business processes.
- Select TSPs’ IoT products and services that are aligned with IoT consortia and are based on a value-chain-driven approach instead of a technology-driven one.

**Related Research:**

"Succeed With Your Industrie 4.0 Initiative Through Efficient Program Governance"

"2016 Strategic Roadmap for Digital Business Transformation"

**Strategic Planning Assumption:** By 2020, 30% of the organizations partnering in Industrie 4.0 initiatives will align their personal data management strategies to overcome end users’ hesitations to applying IoT in their daily lives.

**Analysis by:** Ilona Hansen

**Key Findings:**

The applicability of IoT for consumers will need to be proven. For example, CIOs of refrigerator manufacturers and their project teams need to understand that consumers may not want their refrigerators to communicate their weekly consumption of ice cream to the supermarket. The data provided by these personal insights could also end up with the consumer’s health insurer, followed by a notification of an increase in monthly premiums, as the risk of diabetes has grown. What the data doesn’t reflect is that the consumer has had another person living with them for the past three months; hence, IoT has its limitations.
Generally, the intent of IoT is to increase the consumer experience by assigning daily tasks to machines. The amount of data generated during these interactions is increasing, but so, too, are consumers' concerns about data privacy and protection. These concerns are fostered by IoT failures regarding data interpretation and use, such as in the refrigerator example above. CIOs are challenged internally to ensure proper product enhancement, but also to externally follow up on the alignment of Industrie 4.0 partnerships regarding how end customers' personal data is processed and communicated.

End users will also need to understand what types of personal data are gathered, stored by which entity and for what purpose in order to understand the newly created IoT world. Furthermore, consumers need education on who owns the data, who has the right to use or access it, and, finally, who manages the data collected. CIOs and Industrie 4.0 organizations have to work collaboratively on their go-to-market strategy by emphasizing and addressing their customers' concerns, providing transparency on who is leading this process at a given time. Educated consumers will better understand the advantages provided by Industrie 4.0 technologies and can take responsibility for their consumption.

**Market Implications:**
- End users will become more educated, not only on the new uses of IoT-related goods and services, but, moreover, on the technical aspects of data collection and its consumption.
- The Industrie 4.0 organizations providing IoT goods or services will provide seamless and transparent communication about how the data collected from the end-user community is used and secured, or even deleted after some time.
- Organizations must pay added attention to end users' concerns for data collection, storage, protection and usage.

**Recommendation:**

CIOs should:
- Align with their business partners regarding consumer concerns for their specific IoT offering, and address these concerns as early as possible to educate their target groups.

**Related Research:**

"Hype Cycle for Data Security, 2016"

**Strategic Planning Assumption:** By 2019, half of the government-sponsored Industrie 4.0 initiatives in the manufacturing sector will fall short of delivering on expectations as a result of reduced funding.

*Analysis by:* Simon Jacobson
Key Findings:

Industrie 4.0 has inspired nationally driven industrial digitalization and productivity programs, policies, and initiatives designed to digitalize the manufacturing sector and promote new business models that boost economic competitiveness.

Beyond Germany, the United States (Advanced Manufacturing Partnership and National Network for Manufacturing Innovation), and China (Made in China 2025), other nationally driven initiatives are gaining momentum. These include initiatives in India (Make in India), South Korea (Manufacturing 3.0), Japan (The Industrial Value Chain Initiative) and Taiwan (Five Innovative Industries Policy).

The lineage of many nationally driven programs might appear to vary, but their core concepts have minimal differences and are often borrowed from one another in an effort to be unique. Often targeting the manufacturing sector first, the initial designs of these initiatives feature government-led funding of skills development, technology incubation and infrastructure investments. These are commendable, and core impacts in manufacturing have been recognized to date. We are already seeing — and expect to see in the near future — intensified digitalization and reinvigorated investment in factories. "Factory-of-the-future" initiatives headline investments in IoT, robotics and cyber-physical systems' development.

The other side of these initiatives reflect the shifting dynamics of manufacturing competitiveness. Governments are offering low-cost incentives, including labor, free trade zones and R&D tax credits. In turn, manufacturers are making structural changes to their supply networks to take advantage of these local enablement opportunities.

Although government-designed Industrie 4.0 initiatives promise economic stimulation, the expected GDP contributions of the manufacturing sector tell a different story (see Figure 2). The decreasing contributions are counterintuitive to rhetoric and raise questions of the long-term staying power of several of these initiatives.
Market Implications:

Government-sponsored Industrie 4.0 initiatives are designed to improve economic competitiveness by promoting co-innovation between private- and public-sector entities, as well as academia and industry.

A one-size-fits-all approach does not exist. Currently, the ideals for many initiatives are broad, and the digitalization and attractiveness of smart factories are certainly appealing and have fueled much of the momentum to date. The long-term impacts of these initiatives will be seen through how supply chain strategies evolve in support of Industrie 4.0. Narrow policies that focus on "make it here to sell it here," which are designed to support and protect in-country manufacturers, might create barriers for entry for multinationals and/or hinder the development of an export market. Furthermore, supply chains will also need logistics and ICT infrastructure. Other factors that pose a threat to the lasting power of government-sponsored (and funded) initiatives include:

- **Political instability:** Beyond regime changes and elections, will government funds continue to be available?
- **Innovation policy:** Will innovation policies continue, stabilize or decline? Will formal agendas around digitalization and industrial development follow? How will public-private partnerships and consortia maintain momentum or be subsidized?
Education and skills cultivation: Can talent be retained in markets, or will manufacturing jobs migrate? Will digital or data skills be sufficient to satisfy the demand for data science, the accelerator for business value chains?

Policy alone will not drive industry forward. A lack of economic stimulation could divert the funds earmarked for the manufacturing sector elsewhere. In turn, GDP contribution might be absorbed by sectors such as healthcare, transportation and energy — all of which fall under the broader umbrella of Industrie 4.0.

For the manufacturing sector, longevity is reliant upon ecosystem development. Organizations that are reliant on government-driven funding and policy alone — and that do not take advantage of new ecosystem and alliance opportunities (either with academia, consortia and value chain partners, or a combination thereof) — will fall short of achieving their goals. Instead, success will come from using innovation and breakthrough technologies to cultivate new supply chains and value networks.

Government and private industry mutually acknowledge the importance of technology to catalyze progress, and they are adapting accordingly. Yet, it has taken Germany five years to develop Plattform Industrie 4.0. Will other national programs have similar trajectories?

Joint pursuits of initiatives will prosper if utilitarian efforts are made to benefit multiple value chain participants through a platform that energizes companies of all sizes (not just multinationals or in-country organizations), promotes innovation and reduces total cost of ownership (TCO). An example is provided by Germany’s and Japan’s agreement to evolve a multinational platform focused on supporting technology companies and industry-sector-specific excellence in the respective countries that will benefit from the joint collaboration and regional expertise.

Recommendations:

CIOs seeking to play a leading role in their organization’s Industrie 4.0 initiative must:

- Intensify collaboration with line-of-business — manufacturing and supply chain — counterparts to dissect initiatives into a portfolio of projects with a long-term focus on industrial productivity beyond national and consortium borders.
- Avoid misinterpreting national policy as an advertisement for low-cost manufacturing. Use the awareness and funding opportunities that they provide to establish a self-sustaining digital platform, and invigorate an innovation culture within the organization and with targeted partners.
- Invest in establishing ecosystems and alliances by engaging with community stakeholders, trade unions, and the leadership of your partners and customers about the change management impact and the resulting agility from a more adaptive work and production environment.

Related Research:

"More Than Technology Is Driving the Factory of the Future"
"Industrie 4.0 Partnership Between Japan and Germany Will Drive Game-Changing Opportunities for Manufacturing Sector"

"Combat These Seven Myths of Low-Cost Manufacturing"

**Strategic Planning Assumption:** By 2020, at least 30% of Industrie 4.0 projects will source their algorithms from leading algorithm marketplaces, up from less than 5% in 2016.

**Analysis by:** Thomas Oestreich

**Key Findings:**

- Developing new algorithms is a key challenge to leveraging the data generated from the cyber-physical systems in Industrie 4.0 projects and initiatives.
- Algorithm marketplaces offer reusable algorithms, which help organizations to speed up their development processes and cope with the transformational changes introduced with digital business.
- Organizations can expand and complement their in-house capabilities by leveraging algorithm marketplaces.
- Vendors have started to develop and compete in marketplaces in order to stay relevant and lead in the advanced analytics and data science market.

**Market Implications:**

Industrie 4.0 projects are faced with two significant challenges. First — in the connected world of cyber-physical systems — they need to deal with the sheer volume, often real-time velocity and diversity of data. Second, in order to drive new value and differentiating innovations, new algorithms need to be developed. Algorithms are the heartbeat of Industrie 4.0 projects.

Developing new algorithms requires skills and competencies, such as you would find with a data scientist. Many companies, especially midsize companies in Germany, do not yet have sufficient in-house skills. To increase time to market and speed up the development process, companies engage with service providers, and they will be able to increasingly leverage algorithm marketplaces. Reusing prebuilt algorithms and applying them to a specific use case can significantly reduce development time and will offer an important library, expanding the possibilities for in-house development teams.

Analytics vendors have started creating marketplaces for software components, such as analytical algorithms, to bring greater flexibility and choice to end users. Companies, such as Algorithmia, Alteryx, Apervita, FICO, Microsoft (Cortana Intelligence Suite), IBM (Watson via Bluemix platform as a service [PaaS]) and Teradata, have already developed marketplaces. These marketplaces will bring the benefits of the app economy to software development, thereby radically lowering software distribution costs and improving access to thousands — if not millions — of available algorithms. Marketplaces will offer monetary incentives to make algorithms reusable, further driving choice and fostering reuse; this will inevitably result in standardization from the bottom up.
Algorithm marketplaces will disrupt the analytics ecosystem and likely the whole software ecosystem. For instance, algorithmic models — predicting components' risk of failure — can be applied within many cyber-physical systems. Applying these will significantly change business processes and, therefore, the underlying software to manage the processes. The nascent algorithm marketplaces allow the use of algorithms and other software components to be brokered. These algorithms are not stand-alone apps, but they are meant to be used as distinct building blocks inside specific solutions. Algorithm marketplaces enable an infrastructure to:

- Allow the easy "publication" of algorithms
- Standardize secure access to algorithms either via a REST API or the injection of executable code into a larger runtime environment (for example, in a business application, such as Qlik or Salesforce, or in a PaaS, such as Microsoft Azure, Amazon Web Services [AWS] or IBM Bluemix)
- Facilitate various kinds of licensing mechanisms for the algorithms, and allow the secure distribution of payments
- Provide additional functionality, including discovery mechanisms and community features (search, tagging, recommendations and collaboration); testing/debugging capabilities; and various runtime statistics

**Recommendations:**

CIOs must:

- Build a task force with data and analytics leaders to evaluate algorithm marketplaces.
- Identify use cases, then test algorithms and algorithmic data models that are offered as a service.
- Continuously check and consider offered algorithms for their usability in Industrie 4.0 projects. Create your own library of available and potentially useful algorithms.
- Engage with the developer communities on these marketplaces to stay up to date on the latest developments.

**Related Research:**

"Algorithm Marketplaces Are Bringing the App Economy to Analytics"

"Explore Algorithmic Business to Drive Differentiation"

"Predicts 2016: Advanced Analytics Are at the Beating Heart of Algorithmic Business"

**Strategic Planning Assumption:** By 2020, 50% of the companies that have renovated their ERP core and migrated their IoT infrastructure to a standardized platform will increase customer interactions by over 20%.
Analysis by: Christian Hestermann

Key Findings:

The Internet of Things is considered to be a key enabler for digital business transformation. IoT comprises an ecosystem that includes things, communications, applications and data analysis (see "Internet of Things Primer for 2016"). ERP systems are connected to IoT infrastructure to collect and process incoming data, support the necessary decision making, and trigger actions.

In a way, IoT supporting Industrie 4.0 for manufacturing companies is not entirely new; these companies have been using sensors and actuators in their complex manufacturing equipment since the advent of Computer Numeric Control (CNC) and direct numeric control (DNC) machines. Asset-intensive companies have controlled public infrastructure or chemical plants for decades. Even urban households use devices to measure the consumption of energy and water. But in many cases, these infrastructure components are not connected and are siloed; or, in more advanced cases, proprietary technologies have been used to collect signals and data, and to trigger actions.

Three major aspects are relatively new and are expected to drive scale for Industrie 4.0 implementations. Firstly, public cloud infrastructure is being used, connecting devices over the internet. For instance, home security cameras can be both watched and controlled from an ordinary mobile phone, making the surveillance of homes or other remote locations easy for most consumers.

Secondly, Industrie 4.0 is supposed to connect infrastructures and processes across sites and ultimately beyond company boundaries. Thus, Industrie 4.0 raises specific needs for integration and alignment between the business applications used by these various players, which go further than classic supply chain management.

Thirdly, and most fundamentally, devices can become actuators or autonomous agents by themselves, although with varying levels of autonomy and self-determination (see "Top 10 Strategic Technology Trends for 2016: Autonomous Agents and Things"). Imagine the following scenario: An airline passenger is due to land at his/her destination after a long flight. Some wristband recognizes that he/she should have something to eat and drink before continuing with the onward journey. The device triggers the following actions: It selects what it "believes" is the preferred eatery in the airport, reserves a table at that place, rebooks the train ticket for the onward journey, redirects the person due to pick up the traveler at his/her final destination, rebooks the parking ticket for that person in the nearest garage, and changes the driving directions in the navigation system.

This scenario illustrates, among many other things, that the various restaurants and bars at the airport should invest less in classical marketing and advertising. Instead, they need to advertise directly to the device making the ultimate selection, without the device’s owner necessarily being involved or even knowing who gets the deal and why. The scenario also shows that the various ERP solutions used (for example, in the restaurants) need to be able to handle microbilling directly with the connected devices, sending an invoice to the device and collecting the revenue. Also, the data processed inside the ERP solution — for instance, about business transactions won versus lost — is used to improve the analytics and business processes involved, and ultimately helps to improve
the algorithms used. This scenario identifies a multifunctional usage of IoT data for various business contributors in this value chain. This typifies an Industrie 4.0 retail example.

On a number of levels, this scenario depends on algorithmic business and some sort of artificial intelligence (see "When Smart Things Rule the World — Introducing Autonomous Business"), by deciding which eatery to pick, how much time to reserve for the meal and what food to order at this time of day.

While this prediction focuses on client interactions, noteworthy business benefits can be realized on at least three layers:

- Grow your business by leveraging digital business moments, for example, by using signals coming from sensors inside products or from external sources (like the device in the example above) to reach out and offer additional services to customers. This will likely require the modernization of the ERP solutions involved; older ones will not support the level of granularity and the volumes of microtransactions required.
- Reduce costs by removing proprietary technology that is currently used, and migrate to more general IoT platforms (see "Harness IoT Innovation to Generate Business Value").
- Make better decisions in business processes by using the higher volume and better quality of data coming from IoT, and by using hybrid transaction and analytical processing delivered by in-memory technology (see "How to Enable Digital Business Innovation via Hybrid Transaction/Analytical Processing").

Each enterprise will define an individual mix of these benefits to ultimately leverage the investment necessary for the renovation.

Roughly speaking, IoT infrastructure consists of three layers: sensors and actuators, middleware to collect and store data, and applications and analytics to make decisions and trigger actions (see "Top 10 Strategic Technology Trends for 2016: Internet of Things Architecture and Platforms").

Companies that have been using IoT-like infrastructure are unlikely to replace all the sensors and actuators they’ve installed and maintained over the years. However, they need to determine to what extent, and whether, middleware, embedded software, analytics, security and other capabilities need to be upgraded or replaced to more efficiently connect to the existing sensors and harvest their data, turning it into smart data. This can be done, for instance, by integrating with and, over time, migrating to general-purpose IoT platforms offered by vendors such as Bosch, Microsoft, IBM or Oracle.

The urgency in Industrie 4.0 development to act in relation to business applications and ERP is often high. Many ERP solutions are old, and they cannot cope with the amount of data and transactions to be processed, and the level of granularity in business transactions. One example is the transformation that the music industry went through. Customers went from buying complete albums in a record store to streaming one individual song, which triggers an immediate invoice about the microamounts due. ERP could fast become the bottleneck of digital business, not allowing a business to act quickly enough to grasp digital business opportunities in an ever-faster
changing business world. Leaders in new business areas might conquer the open land, and they will not leave room for laggards that are too slow to gain market share.

**Market Implications:**

- ERP vendors are integrating IoT platforms and offerings into their ERP solutions, or they offer their own IoT solutions (for instance, Microsoft’s Azure IoT Suite and Oracle’s Internet of Things platform). Some vendors, such as IFS, have publicly presented early success stories in the asset management space and the manufacturing operations space.

- Early adopters are renovating their ERP solutions and expanding them to leverage the upcoming general-purpose IoT platforms. They are renovating their business processes according to the opportunities in their respective industries.

- Two-thirds of IoT endpoints are estimated to be consumer-oriented and owned, with the remaining one-third being owned and operated by enterprises. The total number of endpoints is estimated to be 21 billion units by 2020 (see "Forecast Analysis: Internet of Things — Endpoints, Worldwide, 2015 Update").

- Spending on IoT is estimated to be in the trillions of dollars. Total hardware spending alone will exceed $3 trillion in 2020. Business opportunities exist both in the provision of products and services, and in leveraging them for individual business needs.

**Recommendations:**

CIOs, in cooperation with their application managers, should:

- Determine where IoT and digital business play a role in their business scenarios, and develop Industrie 4.0 value chains by modeling the business capabilities that their organizations need.

- Assess their current state and their needs for renovation on all layers of the IoT architecture.

- Assess their readiness for renovation, and take the necessary measures to improve.

- Hire or develop the necessary skills, but be aware of the shortages in this area (see "Preparing, Planning and Architecting for the Internet of Things"). Also, consider the data science that will be involved.

- Start a renovation project for postmodern ERP and the IoT platform. Determine where to focus first, depending on the organization’s maturity, but do not ignore the overall direction.

**Related Research:**

- "The Practicalities of Implementing IoT"

- "How SAP Hana Technology Could Support Your Internet of Things Strategy"

- "Hype Cycle for the Internet of Things, 2016"

- "Top 10 Strategic Technology Trends for 2016: Autonomous Agents and Things"
"Digital Business and IoT Will Drive Significant Changes to ERP Applications and Strategy"

"Succeed With Your Industrie 4.0 Initiative Through Efficient Program Governance"

"Toolkit: Industrie 4.0 Program Governance Development Path"

A Look Back

In response to your requests, we are taking a look back at some key predictions from previous years. We have intentionally selected predictions from opposite ends of the scale — one where we were wholly or largely on target, as well as one we missed.

On Target: 2016 Prediction — By 2017, 70% of organizations will leverage external sources for driving Industrie 4.0.

Many organizations have commenced with their digital transition, but they lack the skills and digital culture needed to execute the technology and business transformation. For the next year, Gartner is observing a large number of consulting and service contracts that support executive management to realize the Industrie 4.0 potential.

Missed: 2016 Prediction — By 2017, cybersecurity will become part of Industrie 4.0's key principles, but will lag in adoption in more than half of all implementations.

In 2016, Gartner witnessed strong concerns about cybersecurity and data breaches, which incorporated security as a guiding principle. However, most of the IoT solution or platform implementations regarding Industrie 4.0 initiatives were driven by an understanding of data privacy and physical security instead of cybersecurity. The lack of a chief information security officer, or a dedicated digital security officer who drives an integrated view of digital security, is frequently cited for the lack of understanding about the challenges in overall security, especially in midsize companies. Gartner strongly recommends adding a digital security principle into the digital transformation governance framework to ensure that all aspects of security, including IoT and identity management, are being evaluated at the time of strategy planning.

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"Succeed With Your Industrie 4.0 Initiative Through Efficient Program Governance"

"2016 Strategic Roadmap for Digital Business Transformation"

"Hype Cycle for Data Security, 2016"

"More Than Technology Is Driving the Factory of the Future"
"Industrie 4.0 Partnership Between Japan and Germany Will Drive Game-Changing Opportunities for Manufacturing Sector"

"Combat These Seven Myths of Low-Cost Manufacturing"

"Algorithm Marketplaces Are Bringing the App Economy to Analytics"

"Explore Algorithmic Business to Drive Differentiation"

"Predicts 2016: Advanced Analytics Are at the Beating Heart of Algorithmic Business"

"The Practicalities of Implementing IoT"

"How SAP Hana Technology Could Support Your Internet of Things Strategy"

"Hype Cycle for the Internet of Things, 2016"

"Top 10 Strategic Technology Trends for 2016: Autonomous Agents and Things"

"Digital Business and IoT Will Drive Significant Changes to ERP Applications and Strategy"

"Toolkit: Industrie 4.0 Program Governance Development Path"