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Market Report | April 2019

# IIOT PLATFORMS FOR MANUFACTURING 2019-2024

## Enterprise Premium Edition

In-depth market report sizing the opportunity of the fast growing Industrial IoT Platforms for Manufacturing market. The 155-page report includes market forecasts to 2024 for the 21 subsegments of manufacturing and a breakdown of market data for within factory versus outside factory environments for discrete, process and batch manufacturing. Key IIoT Platform use cases and real case studies for manufacturing are provided as well as discussions on main industry challenges, adoption barriers and trends currently shaping the IIoT Platforms for Manufacturing market.

IOT ANALYTICS

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# IIOT PLATFORMS FOR MANUFACTURING 2019-2024

**Date:** April 2019

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# Executive Summary

## OVERALL HIGHLIGHTS

- IIoT platforms for manufacturing market reached $1.7B in 2018.
- IIoT platforms for manufacturing market is growing quickly at a CAGR of 39% and expected to attain a market size of $12.5B by 2024.

## TECHNOLOGY

- **5 Platform types:** The IoT platform market can be broken down into 5 types of platform: cloud platforms, application enablement platforms, device management platforms, connectivity platforms, and advanced analytics platforms. These 5 platforms are broken down into 20 sub-elements, in addition to the overarching elements present in all industrial platforms e.g., IoT device SDKs and data acquisition.
- **Hosting environment:** Shift from on-premise to hybrid cloud hosting environments as customers seek more control over both the private and public components rather than just using a prepackaged public cloud.
- **Application deployment architecture:** Early platforms were built as monolithic architectures but are being deconstructed into modular, function-specific, inter-dependent, interacting microservice based deployments e.g., Siemens MindSphere has over 20 such microservices (as of Oct 2018).

## MARKET ANALYSIS

- The **overall IoT platforms market (for all verticals, not only manufacturing) was just under $XX in 20XX** and is expected to grow at a CAGR of XX% to reach $XX in 20XX.
- The **Manufacturing segment for IoT platforms reached $XX in 20XX** (with circa XX% of that within Factory settings and XX% outside of the Factory), making Manufacturing the largest IoT platform segment and it is forecast to remain the largest IoT segment in 20XX almost reaching $XX.
- Within **Factory environments** the IIoT platforms for manufacturing market is estimated **to grow from a $XX market in 20XX to a $XX market by 20XX**.
- Outside of **Factory environments** the IIoT platforms for manufacturing market is forecast to grow from **$XX in 20XX to become a $XX market by 2024**.
- In 20XX, within Factory environments **Discrete manufacturing accounted for $XX** (circa XX% of the IIoT platforms for manufacturing market within factories) and is expected to grow to just under **$XX by 20XX**.

- Within Factory environments **XX manufacturing accounted for $XX** (circa XX% of IIoT platforms for manufacturing market within factories) in 20XX and XXX was $XX (circa XX% of the IIoT platforms for manufacturing market within factories. By 20XX, XXX and XX are forecast to grow to $XX and $XX respectively.
- Within Factory environments XXX manufacturing makes up the largest manufacturing subsegments with **XXX the largest subsegment and the only subsegment forecast to surpass $XX by 20XX,** XXX is followed by **XXX and XXX** estimated to reach $XX, $XX, and $XX by 20XX respectively.

## CUSTOMER NEEDS, USE CASES & CASE STUDIES

- **Customer perspective: Customers use a wide range of dimensions** for IoT platform selection however value for xxx are typically top of mind.
- **Customer needs: xxx perceived as the most important platform features** for customers.
- **xxx and xxx are the biggest use cases for IIoT platforms in Manufacturing:** An increasing number of OEMs are deploying IIoT platform solutions for to xxx.
- **xxx and xxx are also leading IIoT platform use cases:** Companies across a variety of industries (such as xxx) are partnering with xxx to xxx.
- **IoT Adoption more likely from xxx:** xxx and industries with xxx are more likely to adopt IoT products and strategies.
- **xxx are implementing best in class IoT solutions:** xxx are leading the way in IoT adoption, with companies xxx implementing best in class solutions.

## DISRUPTIVE TRENDS & CHALLENGES

- **TREND 1: xxx**
- **TREND 2: xxx.**
- **TREND 3: xxx.**
- **TREND 4: xxx.**
- **TREND 5: xxx.**
- **TREND 6: xxx.**
- **TREND 7: xxx.**

# 1 Introduction to IoT Platforms (general)

The Internet of Things is an increasingly important technology element for companies of nearly all sectors and around the world. For many firms it has become one of the pillars of their "digitalization strategy", promising the enablement of new business cases such as predictive maintenance, fleet management, infrastructure monitoring or analytics-based process optimization. One of the biggest driving forces right now is that connected IoT technology is being increasingly built into everyday products. Everything from bicycles, clothing to standard household appliances are being fitted with sensors and connected to the internet enabling new value creation opportunities. In addition, cars, buildings, machines, and even entire cities are becoming part of a network-enabled ecosystem of things. As part of these connected solutions few companies today build the whole solution themselves from scratch. Rather, IoT (software) platforms have emerged as a crucial enabling element. For companies deploying connected solutions (or building connected operations), choosing a platform that is easy-to-use, comes with the right features and provides end-2-end security has become a topic of major strategic importance.

## 1.1 General role of IoT platforms in the IoT

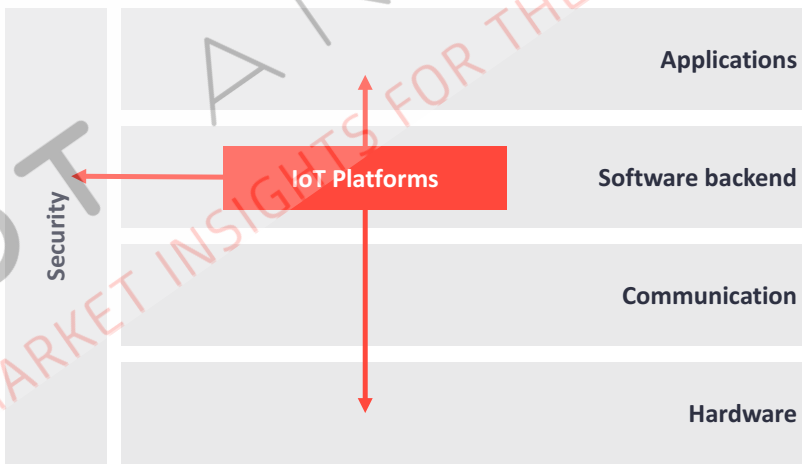



**EXHIBIT 1:** Central building blocks of IoT - IoT platforms are part of the central software backend in the IoT infrastructure. Source: IoT Analytics.

**There are four major technological building blocks of IoT.** To understand the role of IoT platforms in the Internet of Things, it is important to relate to the IoT technology stack. On a high level, four major technological building blocks of IoT exist; hardware, communication, software backend, and applications. Security is an additional element that is so important it needs to be mentioned as a foundation for each of the four blocks.

1. **Hardware:** Every IoT solution has a device layer where physical hardware hosts sensors, microchips, and connectivity modules and in some cases has optional capabilities for storage, manageability, analytics and security. In most cases the physical device itself, whether powered by battery or plugged in to the mains, produces data and on a high level can be classified as a simple or smart device:

   - **Simple Devices:** A simple device is an electronic device connected to a network (or other devices), typically via wireless protocols (e.g., WiFi, MQTT, etc.), that can be to some extent controlled remotely to perform instant actions and transmit generated data. Typically, simple devices have constrained resources, low hardware costs, basic connectivity, basic security/identity, and no/light manageability. A typical example of a device classified as a simple device is a connected lightbulb with a microcontroller (MCU).

   - **Smart Devices:** A smart device refers to a network-enabled electronic device with added capabilities for local compute, storage, edge analytics and time-sensitive decision making for the generated data. There are different levels of "smartness" in devices that typically maximize security, manageability, interoperability for increased solutions reliability and reduced bandwidth costs. In many cases, cloud enabled smart devices are equipped with a microprocessor (MPU) and a natural user interface. A typical example of a device classified as a smart device is a smart connected vending machine.

     - IoT gateways: Other devices in IoT network architectures that can be classified as a smart device include hardware gateways or other edge processing devices such as PLCs. They are an important element in terms of edge and security configuration.

2. **Communication:** The communication part of the technology infrastructure ensures the hardware is connected (e.g., via proprietary or open-source communication protocols) to the network and the software backend. Multiple communication protocols are required across 4 layers:

   - **1. Network access and physical layer:** IoT network technologies such as Bluetooth, WiFi, Ethernet, cellular, satellite and more specialized solutions like LPWAN, Bluetooth, ZigBee, and RFID.

- **2. Internet layer:** IoT network technologies such as IPv6, 6LoWPAN, and RPL.
- **3. Transport layer:** IoT network technologies such as UDP and TCP.
- **4. Application layer:** IoT network technologies such as RESTful HTTP, HTTPS and messaging protocols like MQTT, AMQP, CoAP and XMPP.

Network operators offer both long range / low bandwidth networks (e.g., Sigfox, Weightless, LoRa, LTE-M, NB-IoT) and long range / high bandwidth networks (e.g., GSM, CDMA, LTE, WiMax, M2M, 5G) as well as satellite and fixed networks. In addition, there is a short range mix of networks available (e.g., BLE, WiFi, Z-wave, ZigBee, Thread).

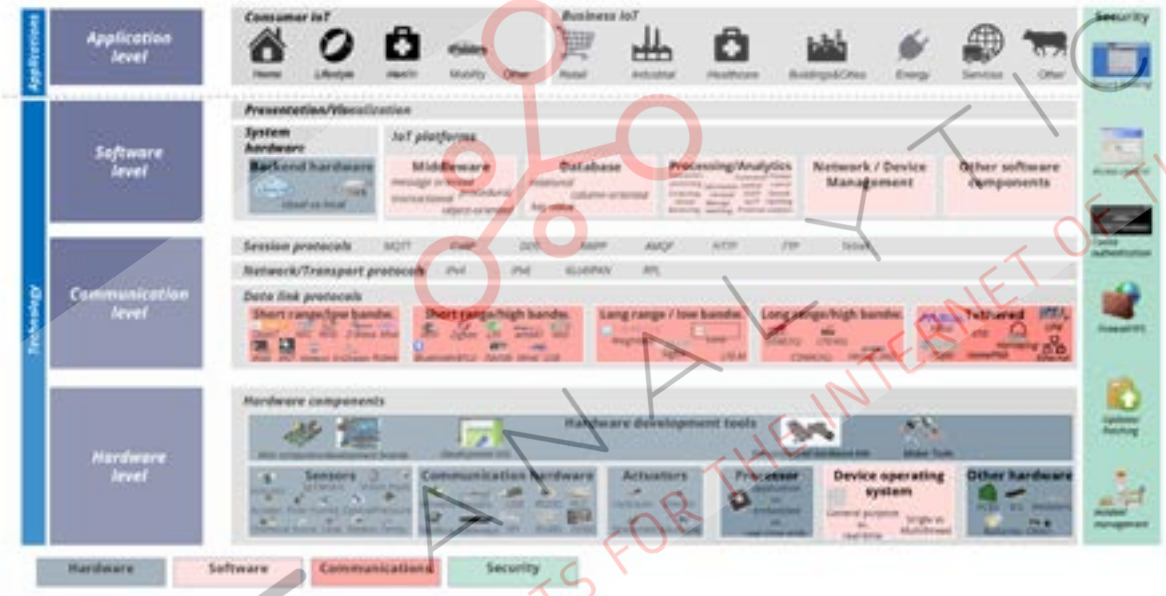



EXHIBIT 2: The technology architecture of the Internet of Things. Source: IoT Analytics.

3. **Software backend:** IoT solutions require a middleware and software backend to ingest, store, manage and transform data to be used in applications. These tasks can be performed through self-programmed proprietary code, through the use of modular or open-source software elements and increasingly through IoT Platforms that promise to bring most or all required elements out of the box, thereby reducing the need to reinvent basic logic. Generally, these IoT platforms are deployed on a private cloud, public cloud or a hybrid of both. Standardized IoT platform offerings can typically be enhanced with additional custom code and add-on features which are often built on-top of middleware to enhance platform capabilities. See Chapter 2 for a more detailed technical specification of IoT platforms.

4. **Applications:** Applications present the IoT use case to the end-user (B2C or B2B) enabling interaction with the physical world. Typically, these applications combine data from real world IoT devices and other sources to give an overview or perform specific tasks. Apps bring the solution to life and can run on devices/things or smartphones, tablets, PCs for human interaction.

5. **Security:** IoT security happens on 4 different layers: device, communication, cloud, and lifecycle management. These layers work in unison combining security solutions across the stack such as security chips, message encryption, disk encryption, user authentication and access control. This multi-layered security approach seamlessly works together to provide complete end-to-end security from device to cloud and everything in between throughout the lifecycle of the solution.

**IoT platforms modularize and standardize IoT solution architecture:** The technology architecture of IoT platforms is currently far from being homogenized or accurately defined. In fact, the technology architecture is rapidly evolving with hundreds of different hardware units, connection protocols, low-level software languages, and an increasing number of applications requiring interoperability throughout the IoT ecosystem. IoT platforms aim to address this diversity with a modular and standardized approach. However, it remains a relatively young infrastructure that has yet to come of age.

**Today, IoT platforms are recognized as a crucial element linking the physical to the digital world.** With a potential billion-dollar market up for grabs, many companies are now offering IoT platforms (or elements thereof) and are striving to become the dominant platform for the IoT. Much like other new technologies that formed in the last 30 years, platforms that secure an early advantage may dominate the market later on due to network effects. (e.g., consider how Apple's iOS platform gained early domination of the smartphone market that earned the company an extremely lucrative and influential minority position against Android in a market that is a quasi-duopoly today.)

## 1.2 Definition of IoT platforms

IoT Platforms are a piece of modular software technology that enable solutions for IoT device connectivity, device management, data management in the cloud, application development and enablement, advanced analytics, and even cybersecurity solutions for connected IoT devices. For this report, IoT platforms can be dissected into 5 parts: 1. Connectivity platforms, 2. Device Management platforms, 3. Cloud backend platforms, 4. Application Enablement platforms, and 5. Advanced analytics platforms. **Note:** The focus of this report is on Device Management, Cloud Backend, and Application Enablement platforms.

1. **Telco connectivity platforms:** are a form of *Platform-as-a-Service* that offer coverage capabilities and solutions for connecting the IoT device, managing and orchestrating connectivity, and provisioning communication services for connected IoT devices typically outside factory environments.

2. **Device management platforms:** are a form of *Platform-as-a-Service* (or device cloud) that handle provisioning tasks to ensure connected devices are deployed, configured, and kept up-to-date with regular firmware/software updates.

3. **Cloud platforms (IaaS backends):** are a form of *Infrastructure-as-a-Service* that offer a scalable enterprise-grade backend for data management of IoT applications and services.

4. **Application Enablement Platforms (AEPs):** are a form of *Platform-as-a-Service* that also offer *Software-as-a-Service* solutions enabling developers rapidly create, test, and deploy an IoT application or service.

5. **Advanced analytics platforms:** are a form of *Platform-as-a-Service* that also offer *Software-as-a-Service* solutions for sophisticated analytics tools including machine learning techniques and streaming analytics capabilities to extract actionable insights from IoT data.

### Other IoT platforms

- **Security platforms:** are a form of *Platform-as-a-Service* that offer advanced cybersecurity solutions across the stack from device, secure communication, secure IoT cloud to secure lifecycle management. Security platforms are beyond the scope of this report, for more research on security platforms check out our dedicated market report IoT security report or our list of 150 security platforms.

- See Chapter 2.1 Technology segmentation for a more detailed breakdown of IoT platforms and their main components.

## 1.3 Industrial IoT Platforms for Manufacturing

Industrial IoT Platforms are tailor made for connecting assets/equipment in industrial settings - such settings are commonly referred to as Industry 4.0 or Industrial IoT environments.IIoT is the industrial subset of the Internet of Things (IoT). At a high level, IoT is about adopting the internet in almost all economic activities, and it focuses on the technology backend for cross category connectivity and interoperability. The emergence and swift development of the IoT is driven by the **six major technological developments** shown in **Exhibit 3**:

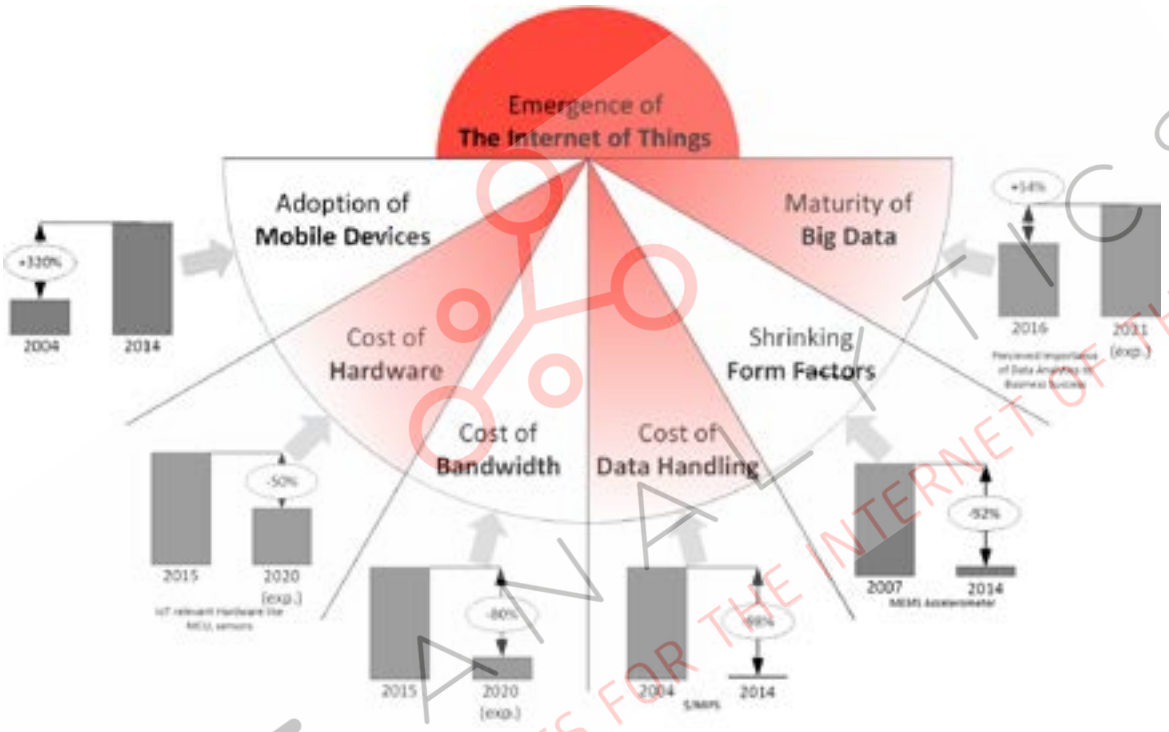



**EXHIBIT 3:** Emergence of the Internet of Things. Source: STM Microelectronics, McKinsey, Yole Développement, IoT Analytics.

1. Increased adoption of mobile devices
2. Declining costs for hardware such as sensors (Through the economies of scale potential from e.g. smartphone production and operation)
3. Declining costs of bandwidth
4. Declining costs of data handling, such as processing ($/MIPS) and data storage ($/GB)

5. Decreased size of hardware elements

6. Increased maturity of big data tools and infrastructure

**Note**: MIPS = Million instructions per second

The Industrial IoT (IIoT) refers to heavy industries such as manufacturing, energy, oil and gas, and agriculture in which industrial assets are connected to the internet. Within IoT, different segments are more "industrial" than others, and "Connected Industry", which specifically focuses on manufacturing, is on the most industrial end of the spectrum as shown in Exhibit 4. This report takes a deep dive into Manufacturing to specifically explore the impact of Industrial IoT Platforms in the sector. For more info on Industry 4.0 see **Appendix E**.

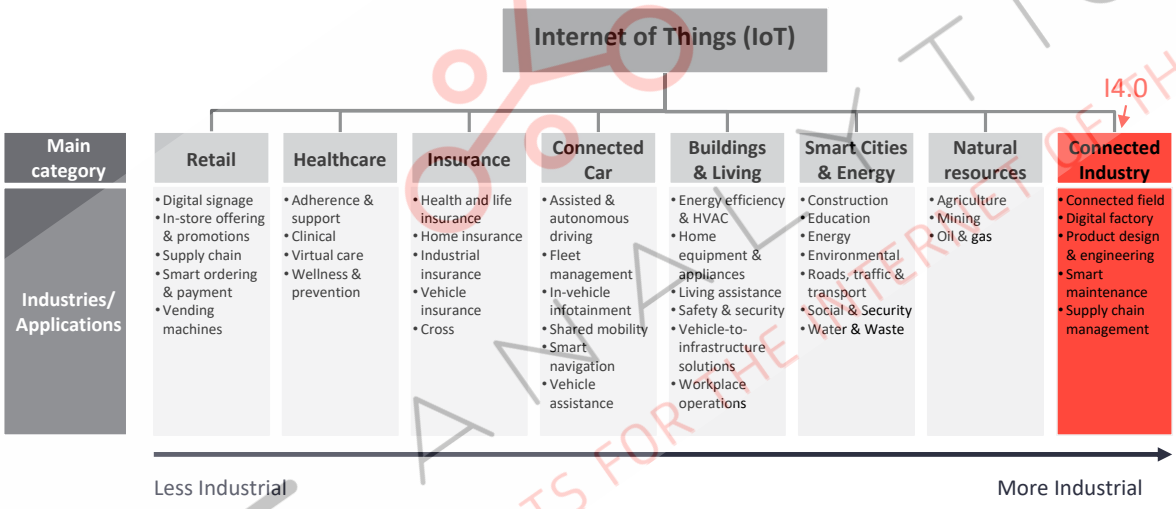



**EXHIBIT 4:** IoT categories sorted from least to most industrial. Source: IoT Analytics

### 1.3.1 Industrial IoT Platforms in the wider industrial software landscape

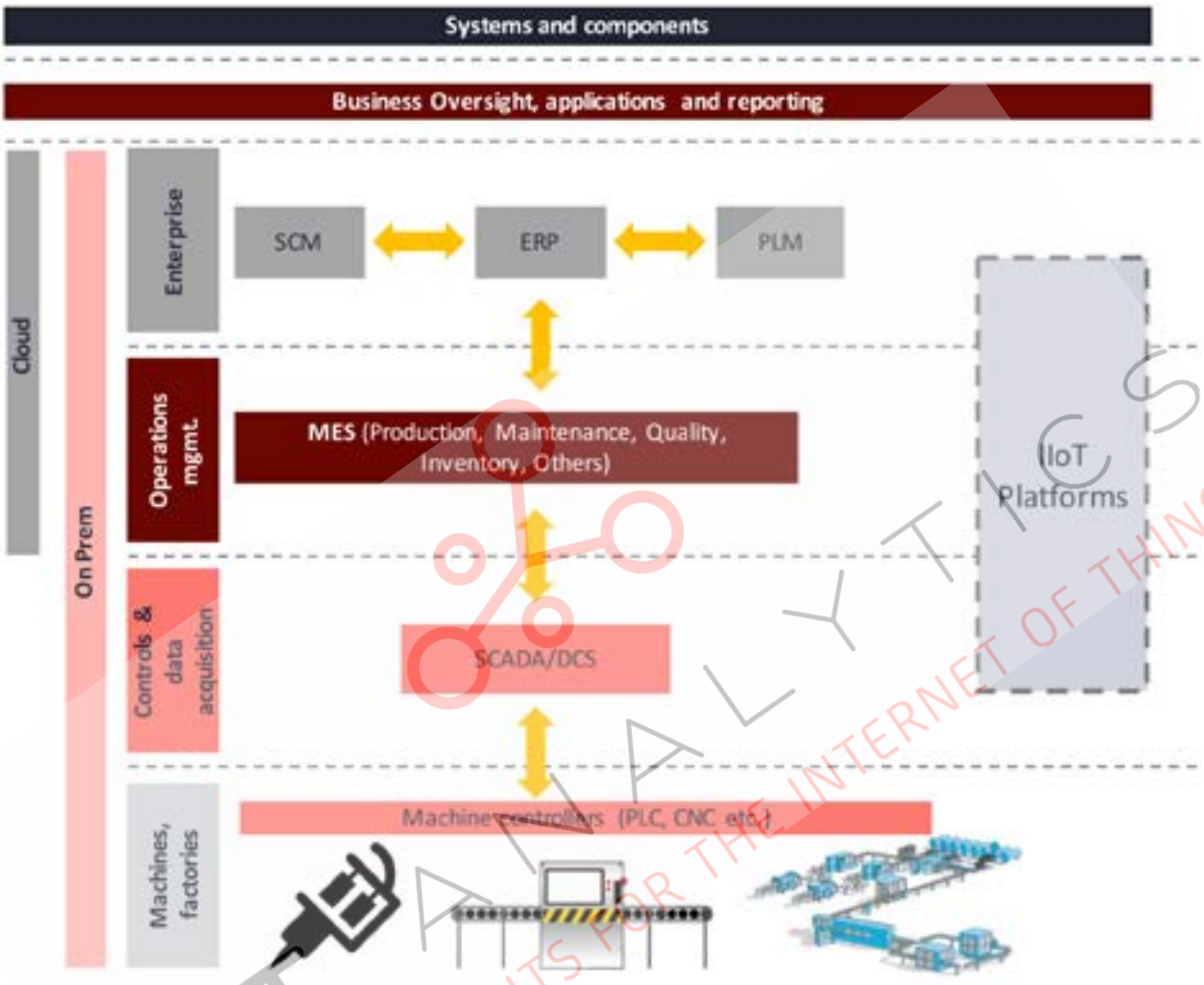



**EXHIBIT 5:** Industrial IoT platforms are adjacent to typical industrial software solutions, but also replacing some of them.

**IIoT platforms are starting to replace existing industrial software solutions.** Typical industrial software solutions include a mix of both IT and OT solutions. IT solutions include common business oversight applications and reporting tools as well as common Enterprise solutions for ERP, PLM, CAD, CAM and SCM. OT solutions include common machine controllers (e.g. PLCs, CNCs, etc) and SCADA/DCS systems for control and data acquistion from machines and the factory floor. Operations management toos such as MES for production, maintenance, quality, inventory, etc can be classified as a mix of IT and OT technologies. Industrial IoT Platforms are an adjacent technology to these typical industrial software solutions but are now starting to replace some of them in smart connected factory settings - see chapter 4 for more details.

# 2 Technical Overview of Industrial IoT Platforms

This chapter provides an overview of the fundamental technological components of an IoT platform, the hosting environment and application deployment architecture options, and describes the role of edge computing and digital twins before introducing interoperability, standardization, security and other elements of an IoT platform. Understanding these components and concepts is vital to fully comprehend the differences between IoT platforms on the market.

## 2.1 Technology segmentation

| | Platform type | Elements/components |
|---|---|---|
| 5 | Advanced analytics platform | Streaming analytics |
| | | AI/Machine learning |
| 4 | Application enablement PaaS | Digital twins |
| | | Rules engine & event management |
| | | Integrated development environment |
| | | Business app integration & visualization |
| | | IoT application marketplace |
| 3 | IaaS / cloud backend | IoT hubs |
| | | Scalable storage |
| | | Multi-modal database support |
| | | Data processing |
| 2 | Device management PaaS | Deployment configuration |
| | | Device monitoring |
| | | Command & control |
| | | OTA firmware updates |
| | | Edge application lifecycle |
| 1 | Telco connectivity platform | Connectivity orchestration |
| | | Connectivity management |
| | | Service provisioning |
| | | Billing management |
| 0 | Industrial data connectivity platform | IoT Device SDKs |
| | | Data acquisition drivers & interfaces |

EXHIBIT 6: The 5 types of IoT Platform and their elementsl. Source: IoT Analytics.

# 3 Market Analysis

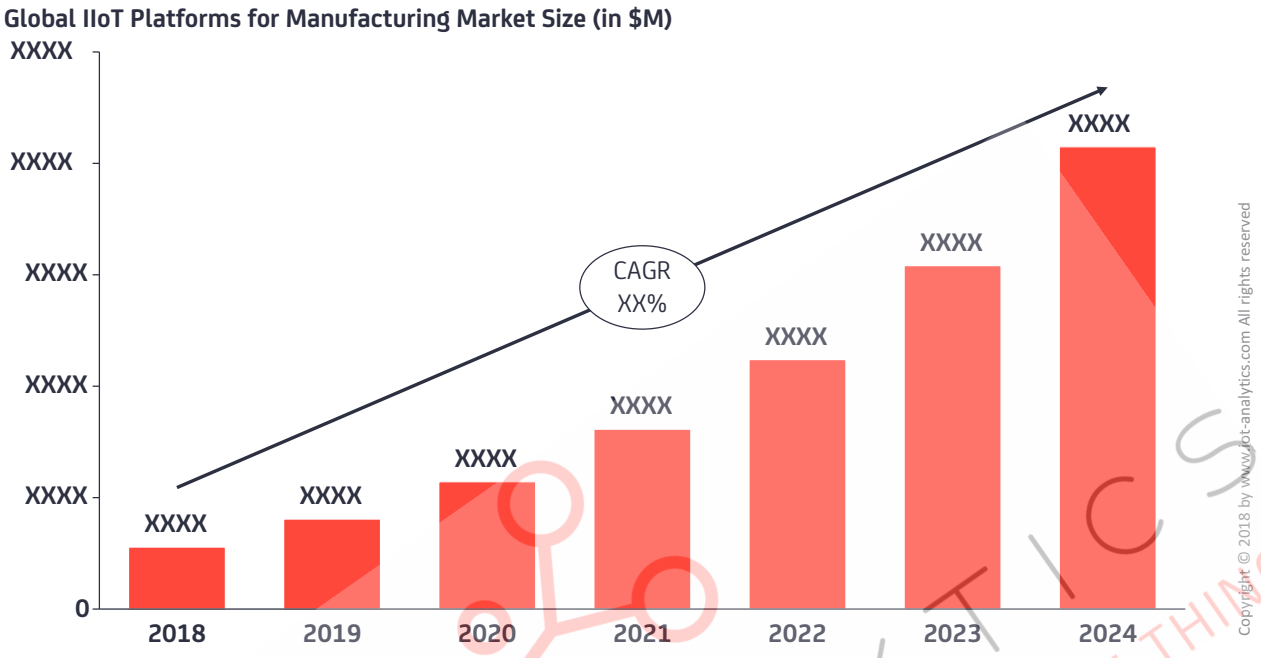
This chapter presents analysis of the IIoT platforms for manufacturing market including a total market forecast to 2024. The analysis first breaks down the overall IIoT platforms for manufacturing market into two distinct types: within factory environments and outside factory environments. Within factory environments are then further broken down into 3 main types of manufacturing: discrete, process and batch. Market numbers for IIoT platforms for manufacturing are provided for 21 industry subsegments.

Market sizing by region is provided with three regional deep-dives as well as a market split by technology (platform type and deployment type).

## 3.1 Market characteristics overview

The IIoT platforms for manufacturing market remains fragmented with many players competing for market share. Signs of consolidation are only slowly appearing with a number of acquisitions and mergers in recent years e.g., relayr was acquired by Munich Re in 2018 and Cumulocity was acquired by Software AG in 2017. The fact that this market was more or less non-existent a decade ago means most platforms are only a few years old and the nascent market is currently full of early phase IIoT projects. IoT Analytics' research shows proof of concepts, pilot projects and small-medium scale deployments account for 83% of identified enterprise IIoT projects. Nevertheless, some platforms are now becoming more mature and supporting larger roll-outs such as Microsoft and AWS.

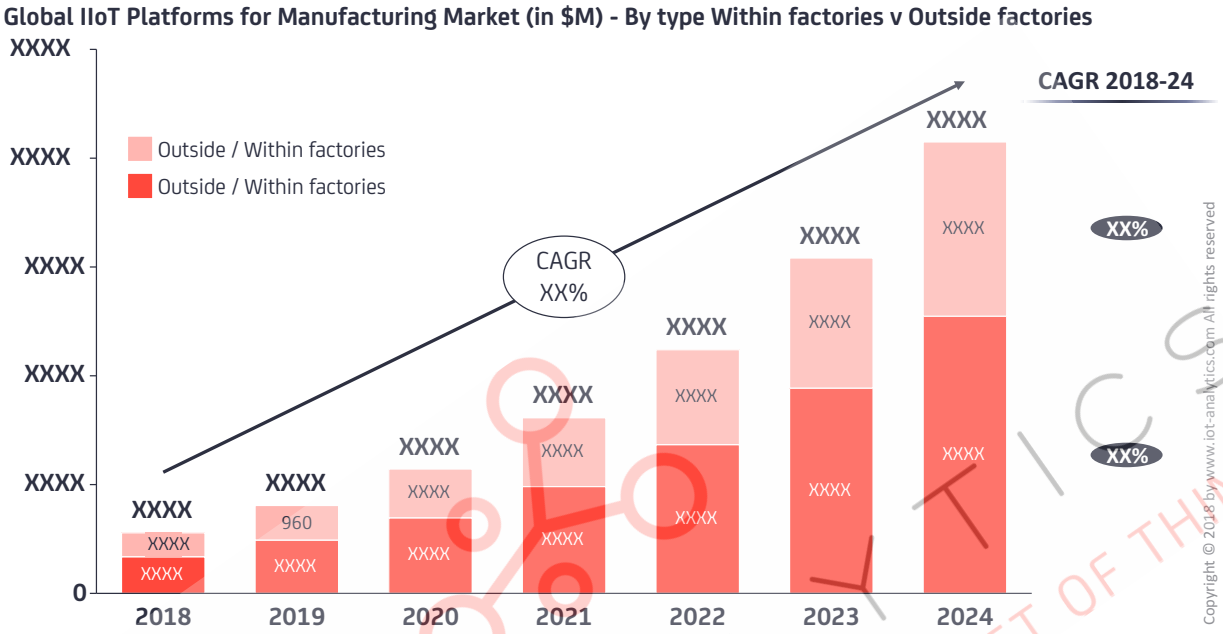
## 3.3 IIoT Platforms for Manufacturing Market Size




**Note:** The IIoT Platforms for Manufacturing market accounts for both Factory & Non-factory settings; that is standardized production environments such as factories, plants, workshops, as well as custom production worksites such as mines, offshore oil&gas and construction sites.
**Source:** IoT Analytics – March 2019

**EXHIBIT 18:** Global IIoT Platforms for Manufacturing Market Size (in $M) 2018-2024. Source: Iot Analytics - March 2019

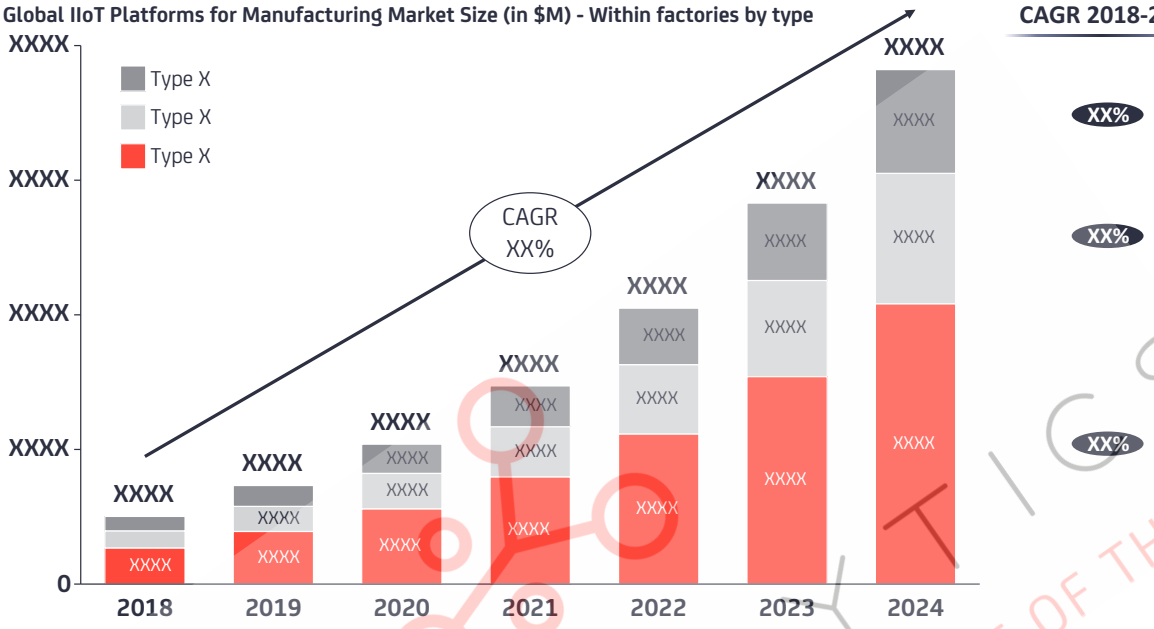
### 3.3.1 Manufacturing market by Type: Within factory environments versus Outside factory environments




**Note:** The Manufacturing segment of the IoT platforms market accounts for both Factory & Non-factory settings; that is standardized production environments such as factories, plants, workshops, as well as custom production worksites such as mines, offshore oil&gas and construction sites.
**Source:** IoT Analytics – March 2019

**EXHIBIT 19:** Global IIoT Platforms for Manufacturing Market (in $M) 2018-2024 by type within v outside factory environments. (Source: IoT Analytics - March 2019)

### 3.3.2 Manufacturing market Within factory environments by Type: Discrete, process, batch

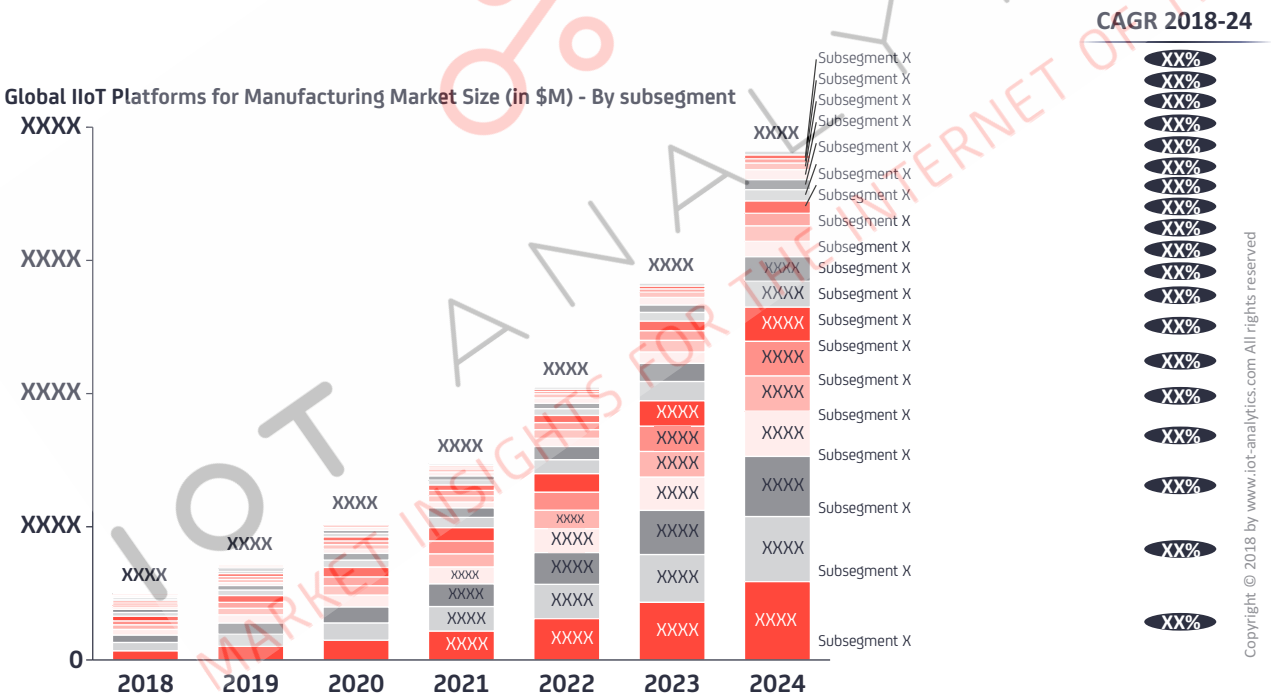



**Note:** The global market size of IIoT Platforms for Manufacturing inlcudes Factory settings such as standardized production environments, factories, plants, workshops and can be broken down into 3 representative types of Discrete, Process, and Batch Manufacturing.
**Source:** IoT Analytics – March 2019



**EXHIBIT 20:** Global IIoT Platforms for Manufacturing Market Size (in $M) 2018-2024 within factories by type. Source: IoT Analytics.

### 3.3.3 Manufacturing market Within factory environments by Subsegment




**Note:** The Manufacturing segment can be broken down into 21 subsegments.

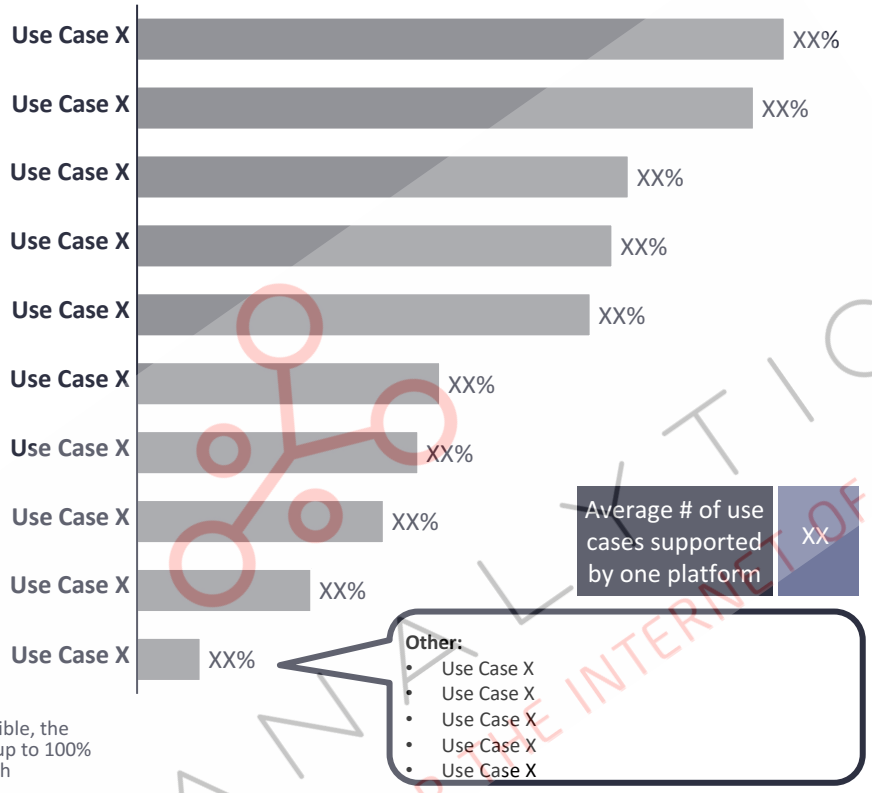
**EXHIBIT 21:** Global IIoT Platforms for Manufacturing Market Size (in $M) 2018-2024 within factories by subsegment. Source: IoT Analytics.

The Within factory type of IIoT Platforms for manufacturing can be broken down into 21 subsegments.

### 3.3.3.1 COMMONLY DEPLOYED USE CASES

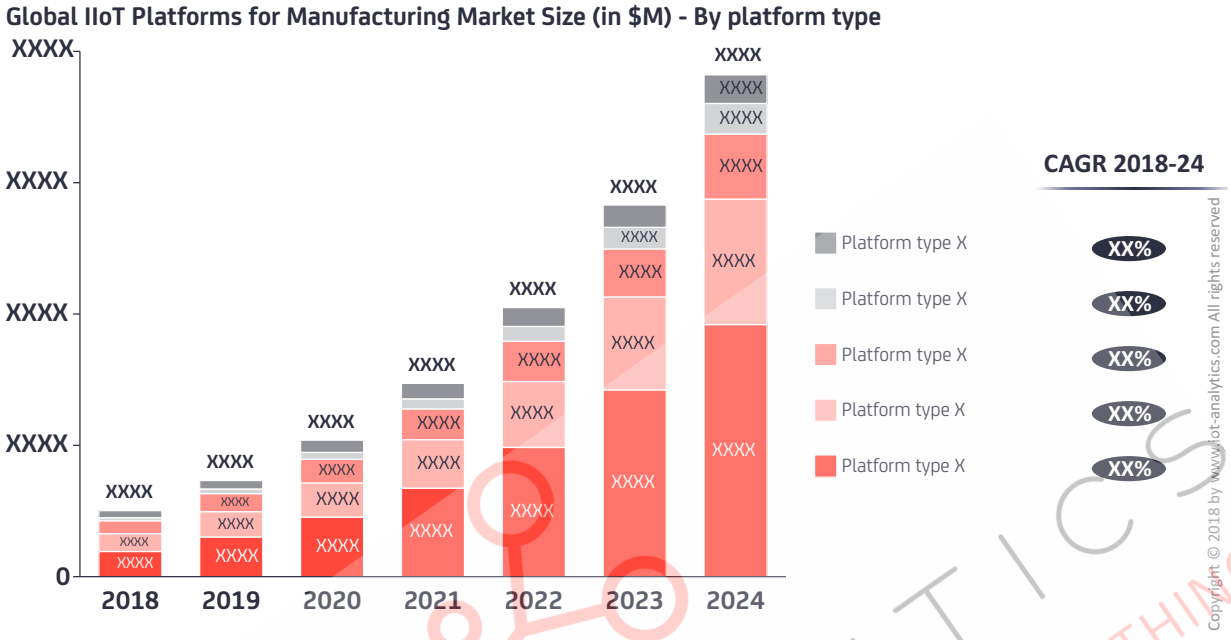
## List of overall top use cases in Manufacturing

**Question: Can you indicate for which Manufacturing use cases you have evaluated IIoT platforms?***




* = More than one answer possible, the numbers therefore do not add up to 100%
**Source(s)**: IoT Analytics Research

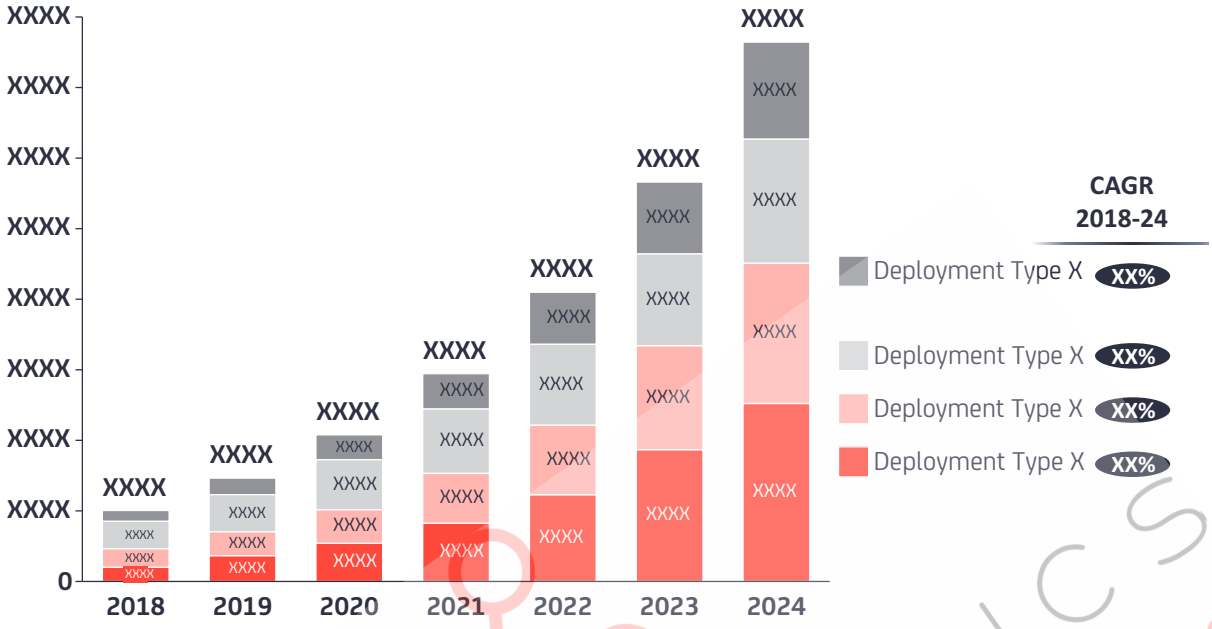
**EXHIBIT 25:** List of overall top use cases in Manufacturing




**Note:** The IIoT platforms for manufacturing market is broken down into 5 platform types: Cloud platforms, Application enablement platforms, device management platforms, connectivity platforms, advanced analytics platforms.
**Source:** IoT Analytics – March 2019

**EXHIBIT 26:** Global IIoT Platforms for Manufacturing Market Size (in $M) 2018-2024 by platform type. Source: IoT Analytics.

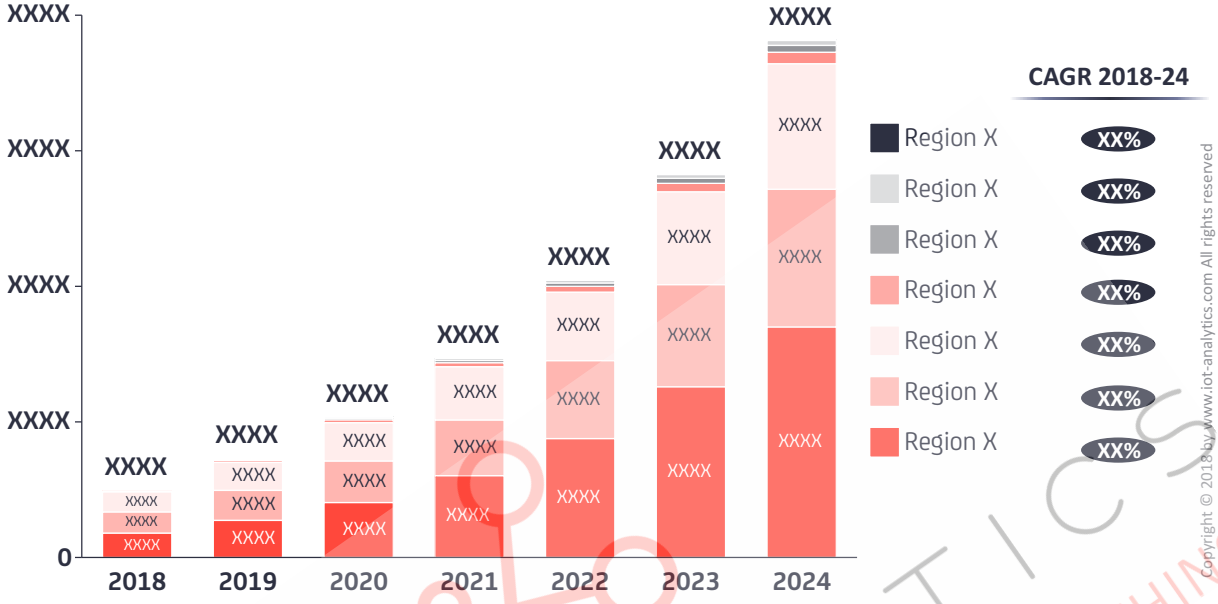
**Global IIoT Platforms for Manufacturing Market (in $M) - By deployment type**




**Note:** The IoT platforms market is broken down into 4 deployment types: on-premise, hosted private cloud, hybrid cloud, and public cloud.
**Source:** IoT Analytics – March 2019

## 3.4 Market by region

**Global IIoT Platforms for Manufacturing Market Size (in $M) - By Region**




**Note:** The worldwide IoT platforms market is broken down into 7 regions: Asia, Europe, North America, MEA, Oceania, South America, and Rest of World.
**Source:** IoT Analytics – March 2019

# 4 Customer Needs, Use Cases and Case Studies

## 4.1 Customer Needs

From a customer perspective there are typically 5 phases of IoT solution development: 1. Business case development, 2. Build vs. buy decision, 3. Proof of Concept, 4. Pilot, and 5. Commercial deployment. Generally, once the business case has been laid out the first question to answer is the build vs. buy decision.

Recently, with increasing platform maturity, more buy decisions have been witnessed in the market – in contrast to 4 years ago where the decision was commonly to build in-house. Now many platform components are modular and are bought with different nuances, for example, buying of IoT cloud components is very common because they are the hardest and most costly to replicate for any end-user. This is less so for AEPs as one platform executive recently said, *"the biggest competition is not another company but do-it-yourself"*. Customers use proof of concepts to get IoT implementations up and running while pilots typically follow for more extensive testing phases. Cisco reports that only 26% of IoT projects survive the pilot stage while the World Economic Forum reports that 71% of industrial IoT firms are stuck in pilot purgatory. Thus, customers are aware that reaching full-scale commercial deployment is no easy task.

This section describes in more detail the platform selection and evaluation process, the importance of choosing a lead vendor and understanding their partnership ecosystem, and the most important customer needs.

### 4.1.1 Platform selection & evaluation

**Customers use a wide range of dimensions for IoT Platform selection.** Selecting the right IoT platform can be a difficult task for customers with a lot of vendors claiming to do it all. Based on recent research and customer interviews, a set of IoT platform criteria became evident. Table 10 shows a breakdown into 18 distinct selection criteria:

| IOT PLATFORM SELECTION CRITERIA | |
|---|---|
| **More qualitative interpretation required** | **Less qualitative interpretation required** |
| 1. Value for money | 9. E2E security |
| 2. Degree of Vendor lock-in | 10. Completeness of offering |
| 3. Platform life expectancy | 11. Scalability |
| 4. Size and stability of the provider | 12. Usability |
| 5. Support availability | 13. Interoperability |
| 6. Control points | 14. Modularity |
| 7. Previous Partnerships with customer | 15. Pre-configured solutions |
| 8. Strength of Partnership ecosystem | 16. Edge capabilities |
| | 17. Degree of Open source |
| | 18. Multi cloud options |

Table 10: IoT platform selection criteria.



**Typical selection process:** The typical selection and evaluation process involves 3 steps:

1. **A pre-selection of platform vendors based on qualitative criteria is always the first step –** Stability of the provider, platform's life expectancy, support, advertised capabilities and previous experiences and/or partnerships with the vendor are the most common evaluation factors in this step. The pre-selection process can differ on a company by company basis ranging from assessing a handful of vendors to tens of vendors (e.g., 2-50 vendors). In any case, the aim is to narrow the options to a few chosen vendors before completing a proof of concept.

2. **Proof of Concept (PoC) projects to technically evaluate the pre-selected platforms** – After short-listing a number of platform vendors, most companies run real-life PoCs to test the platform performance and capabilities using different technical criteria (e.g. amount and quality of functionalities, tools and services, usability, security, interoperability, etc.). Often, also other factors like cost and platform ecosystem are taken into account in this step. Many companies starting their digital journey don't want to commit to a specific platform from the start instead trying out different platforms before committing to one or more for a long time. They are basically "playing" with them to see how they work and what advantages they can get from them, while keeping their eyes open for other options. The number of PoCs undertaken with different vendors can depend on the customer resources (e.g., financial) available. However, PoCs are a common denominator with all vendor selections. For example, Exhibits 32-35 show four examples of the selection and evaluation process for different companies:

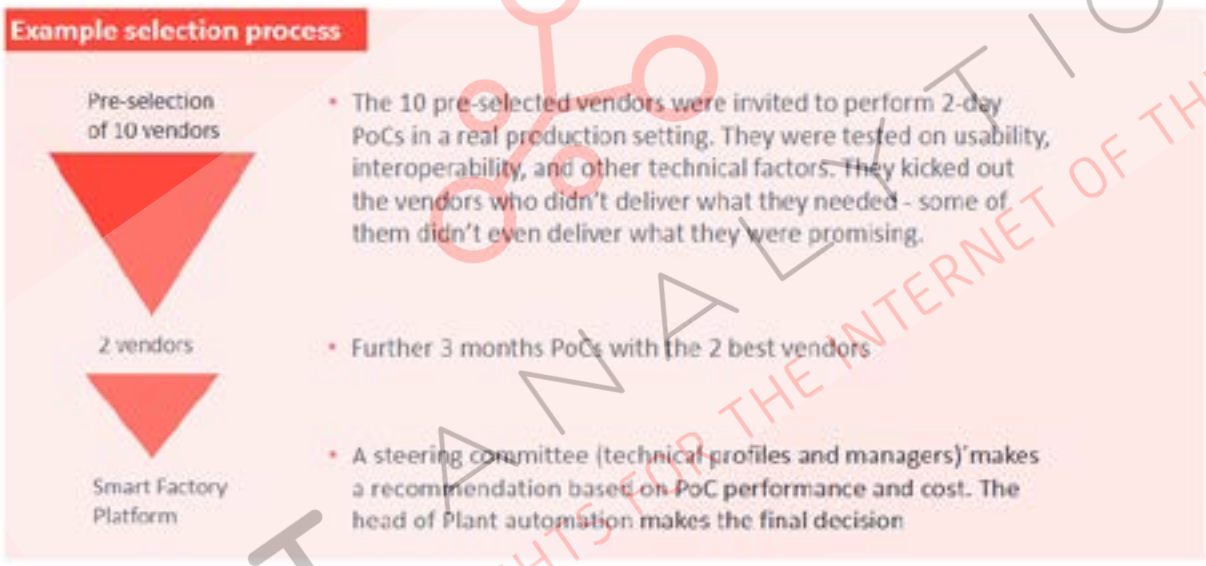
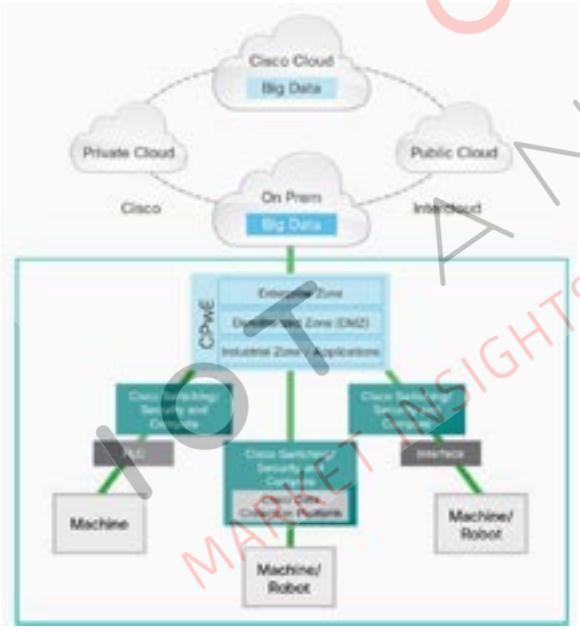



**EXHIBIT 32:** Example of the selection and evaluation process of an IoT platform - Automotive OEM. Source: IoT Analytics.

#### 4.2.1.1 CASE STUDY: AUTO MANUFACTURER SAVES ~$40M IN DOWNTIME BY SENDING DATA TO THE CLOUD

| **I4.0 Technology:** Connected Industry | | Improvement: Lowered Costs |
|---|---|---|
| **Fanuc Corp.**<br>www.fanuc.co.jp<br>Oshino, Japan<br>4,500+ employees | FANUC CISCO | **Cisco**<br>www.cisco.com<br>San Jose, CA, USA<br>75,000+ employees |

Robotics manufacturer FANUC recently partnered with Cisco on a 12-month zero downtime (ZDT) pilot project for a major automotive manufacturer to decrease downtime and boost OEE. At the heart of the FANUC and Cisco solution are big data analytics at the network edge and in the cloud. FANUC robots contain sensors that constantly gather data on temperature, cycles, machine operator activities, and other metrics. This data is then dynamically analyzed to predict wear on parts such as bearings or transducers.




In the past, these types of maintenance issues could only be identified if a component failed and was manually checked by a technician. With the ZDT solution, robots are connected through a secure Cisco network and then into a Cisco edge compute data collector in the plant. The solution forwards relevant maintenance data to the Cisco cloud where an analytics engine captures out-of-range exceptions and predicts maintenance needs. The cloud app alerts FANUC service personnel and its manufacturing customer about the need for a replacement part. The part is automatically shipped to arrive at the factory in time for the next scheduled planned maintenance window. This kind of proactive, planned maintenance can unleash dramatic savings. One automobile manufacturer estimates unplanned downtime costs thousands per minute in lost production. **FANUC is helping this customer save an estimated $40 million in downtime**.

## 4.3.1 Case Studies

### 4.3.1.1 CASE STUDY: LIEBHERR FLEET MANAGEMENT FOR CONSTRUCTION EQUIPMENT

1 Construction Equipment & Building Material Machinery

## Liebherr LiDAT

**Overview**

**Main theme:** Fleet Management for Construction Machines
**Project start date:** N/A; (Market intro: ~2010)
**Project goal/size:** 100% of fleet
**Technology partners:** Microsoft, zühlke, DEVICE INSIGHT

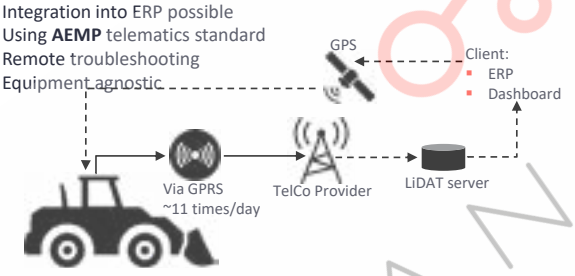
**Project status**

BC BvsB PoC Pilot **Deploy**

### Technical product details

**Offered service:** Remote Condition Monitoring via the internet (current location, performance and machine data; up to 400 parameters)
**Characteristics:**

- Bi-directional data transfer via GSM/GPRS, Edge, Wi-Fi (with extra hardware)
- Localization & Geofencing solution via GPS/GLONASS
- Built-in battery for functionality while machine is off
- Integration into ERP possible
- Using **AEMP** telematics standard
- Remote troubleshooting
- Equipment agnostic




### Project implementation details

**Organizational setup:** Zühlke Engineering acted as System Integrator performing the following tasks: Project Management, Usability engineering, Security, Business Case Development, Vendor selection, Hardware/Software integration

**Continuous developments** since rollout in 2010; including big data analytics, alerts, remote service and spare part management integration; new smartApp launched in 2016.

### Go-To-Market

**Freemium** – No further information available

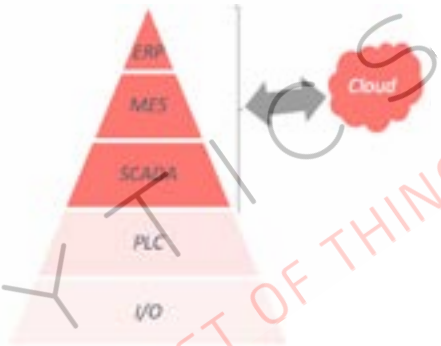
# 5 Market trends and challenges

This section introduces 7 of the current trends that are disrupting the IIoT platforms for manucaturing market.

## 5.1 Trend 1: Platforms act as an enabler to move applications and data to the Cloud

**Key Takeaways**

- **New technology is accelerating SCADA/MES cloud adoption**. Advancements in cellular communication (5G), cyber security, and industrial gateways are making it more technically viable for companies to move their SCADA and MES systems to the cloud.
- **Vendors are adopting different cloud architectures.** Some industrial automation software vendors are opting for "Platform-as-a-Service" models, while other vendors look to remain platform agnostic.
- **Azure is emerging as the leading I4.0 cloud infrastructure provider**. Many major industrial automation companies have chosen Azure as either an IaaS and/or PaaS partner.




More and more industrial applications and data are moving to the cloud and IoT Platforms are emerging as a key enabler for this.

### Appropriateness of the cloud

Whether or not applications should be hosted in the cloud depends on both the application and industry requirements. As a general rule, the higher up the stack an application is, the less important it is to have low latency, bi-directional, and highly available communications with I/O devices, which is illustrated in **Exhibit 48** below.

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