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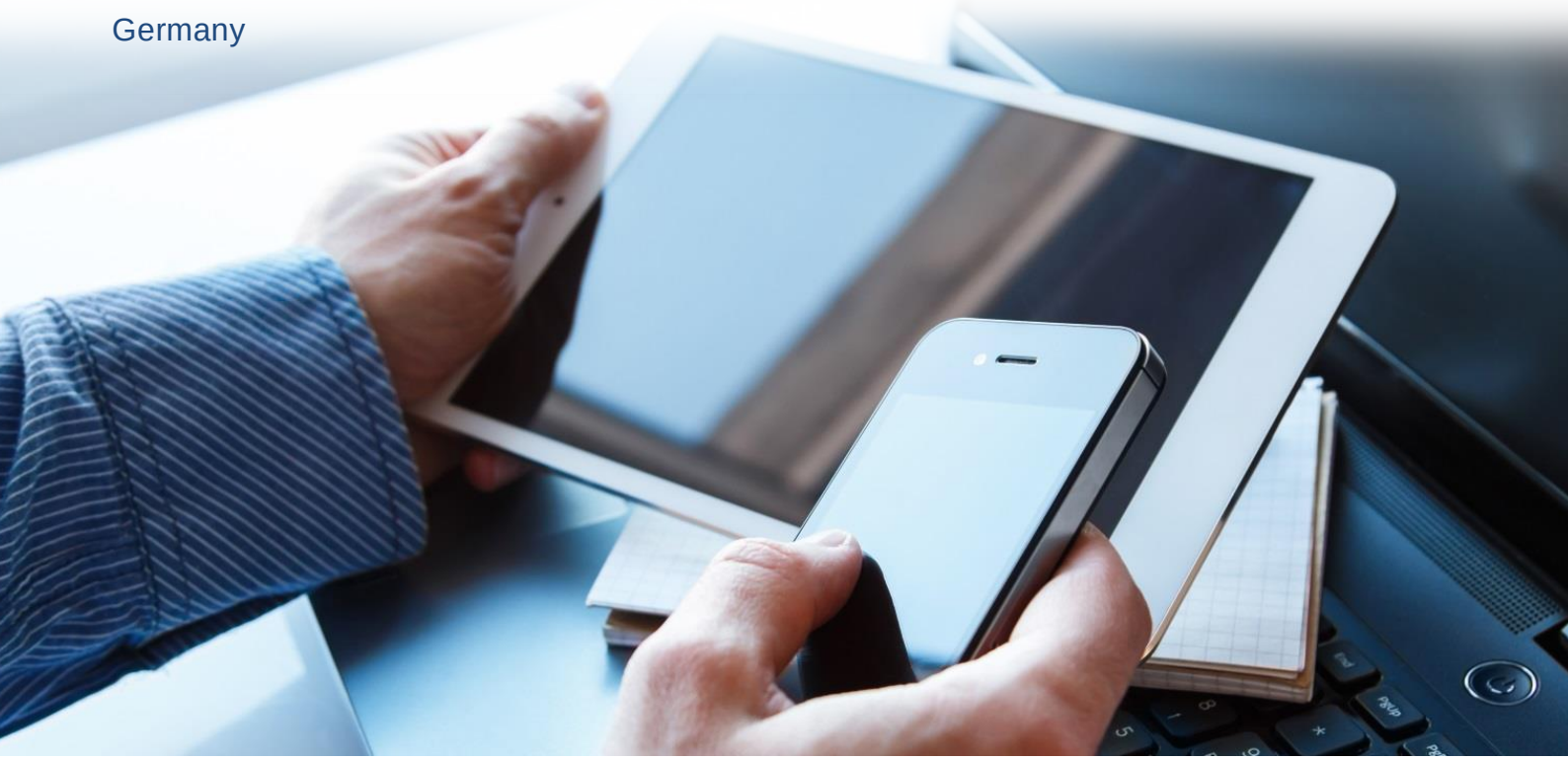
I4.0 / IoT

Industrie 4.0 / IoT Vendor Benchmark 2017

Germany



An Analysis by Experton Group AG

an ISG business

Munich, Germany

October 2016

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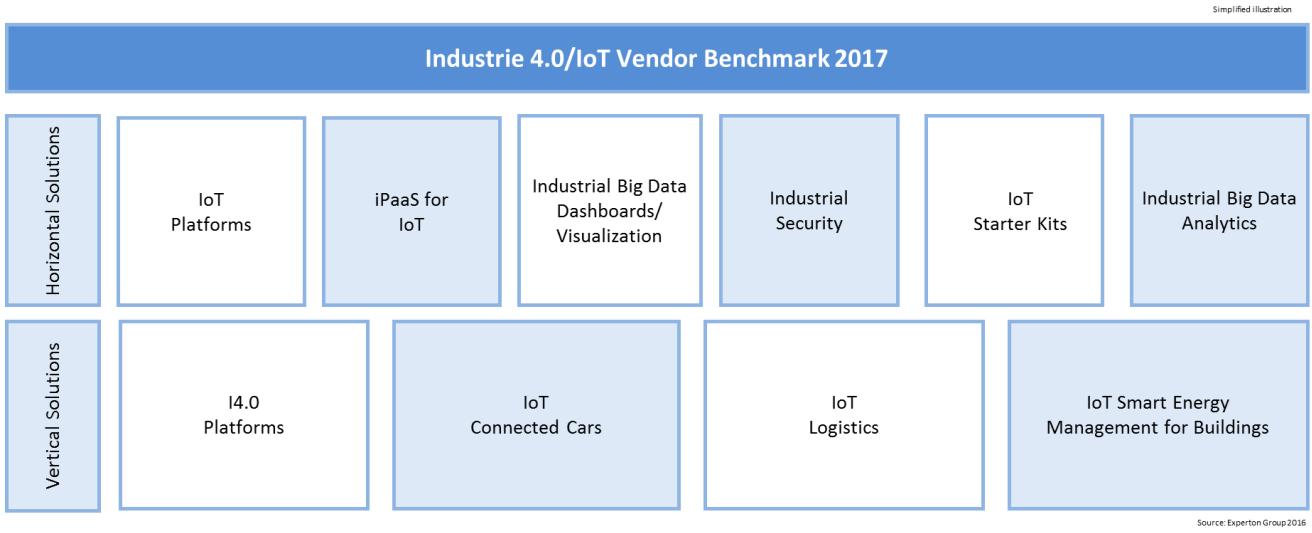
1. EXECUTIVE SUMMARY

- Surprisingly, our expectations that many new **IoT platforms** would enter this market segment have not been fulfilled. Rather, we observed more market exits than new entries into this market. Market consolidation is occurring much faster than expected.
- Those who will become established players in the market are not necessarily the providers with the best **IoT platform** technology, but those who can establish a partner ecosystem around their own IoT platform.
- **iPaaS for IoT solutions** are useful add-ons to IoT platforms to ensure easy and fast integration of IoT platforms with other data sources and applications. Interestingly, many iPaaS providers have not addressed the IoT topic yet.
- **IoT starter kits** provide independent developers and technically savvy users a fast and easy IoT entry level. The multitude of available sensors is currently limited, but more and more types of sensors will be offered within IoT starter kits in the future.
- The market for **industrial big data analytics** is getting increasingly complex, and new providers from the traditional business intelligence, the big data or the automation technology segment are entering this market.
- Major risks for industrial control systems are not related to information losses, but rather include system failures, communications losses and a loss of control. Often, such disruptive scenarios are a result of malware and DDoS attacks. **Industrial security solutions** shall help prevent such attacks.
- The market for **industrial big data visualization** is not about “control systems” that come with a more state-of-the-art visualization technology for data from traditional systems, but about means to consolidate data from multiple systems to gain new insights.
- A new market segment for **I4.0 platforms** is evolving. Often, the focus is on MES solutions, which are advanced to support flexible self-optimizing production processes. Users are challenged to master the flood of data in real time, while also ensuring an increasing degree of flexibility. Setting up analytics/big data capabilities and microservice structures are key challenges on this way.
- **IoT logistics** has a focus on product tracking and transport path optimization as well as fleet management for forwarding agents. Smart fleet management solutions go

beyond GPS tracking of vehicles and analyze consumption data, maintenance needs caused by wear and tear and fuel optimization.

- In the **connected cars** segment we have observed significant progress regarding the automation of in-car support systems and the connectedness between vehicles. In the German market, these challenges are mostly addressed by traditional IT system houses who are actively engaged in respective consulting projects.
- As of to date, only very few completely connected **smart building** solutions are available. Current developments have a key focus on **energy management** for buildings. This market is populated by traditional providers of IT integration services such as Atos and IBM as well as specialized companies such as Caverion, Kiwigrid and Siemens Gebäudeautomation.
- Overview of market categories:

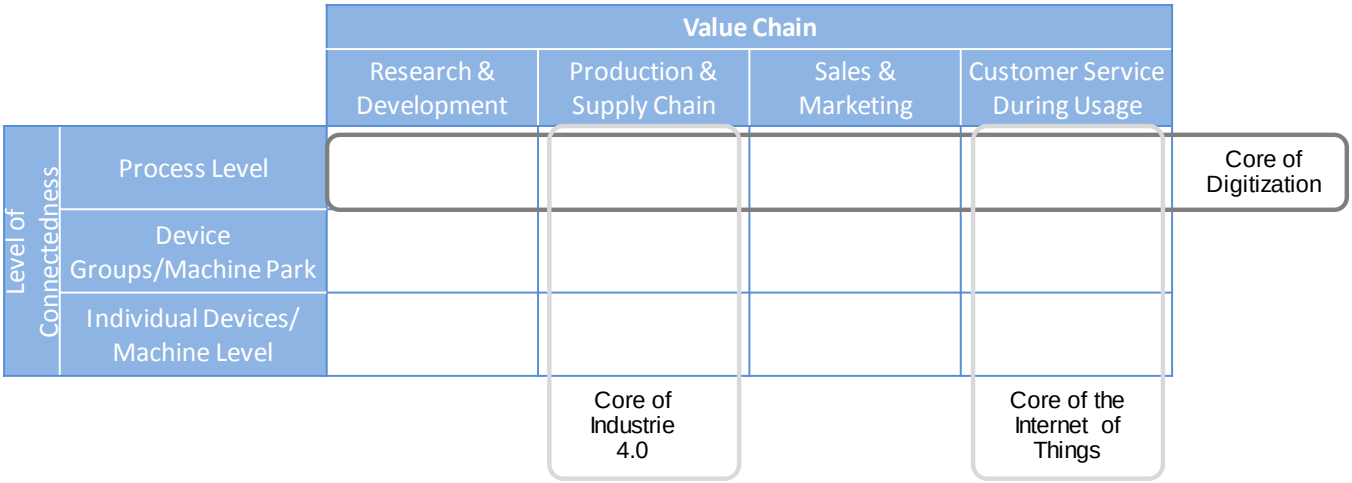


Source: Experton Group, 2016

Figure 1: Overview of market categories

2. INTRODUCTION

2.1 Industrie 4.0/IoT Definition



Source: Experton Group, 2016

Figure 2: Definition of I4.0, IoT and digitalization

- **I4.0/IoT describe the increasing connectedness and automation of devices.** Both terms – Industrie 4.0 (I4.0) and the Internet of Things (IoT) – address the same dynamics of change, i.e., the increasing connectedness and automation of devices, machines and products. I4.0 and IoT examine the possibilities and opportunities arising through increasing connectedness on various levels – from the device and machine level, to the machine park level (in production) or device groups (customers' use) to connected machines and products on a business process level.
- **I4.0 refers to digital production & logistics through connected machines and product components.** Industrie 4.0 has a basic focus on the production process within a "smart factory", based on highly connected and automated machines that communicate with each other and with the elements that they process, such as all kinds of components and resources, which are pre-produced and provisioned through a logistics chain. In the wider sense of the term, Industrie 4.0 comprises not only the production process, but any kind of internal service provisioning, including the control of critical infrastructures such as utilities or the health care segment.
- **IoT refers to connected products that digitize customer service and product usage.** The Internet of Things does not have a focus on production, but rather the customer usage phase of digitized and connected devices and products (in the B2B and B2C context) to enable the exchange of communications with providers' own products during the customer usage phase and new "digital" customer services such as predictive maintenance.

- **Digitization refers to horizontally integrated processes within an increasingly autonomous value chain.** Besides the production process (I4.0) and the customer usage phase (IoT), I4.0 and IoT also address the impact on other parts of the industrial value chain such as research & development and sales & marketing. Obviously, both topics overlap with the holistic “digitization” topic. “Digitization” refers to the increasing integration of the horizontal value chain towards an increasingly autonomous value creation process.

2.2 Market Developments

2.2.1 Trend Topics

IoT/I4.0 Killer Application

On trade shows and events that address IoT/I4.0, a key question is: What is the IoT/I4.0 killer application? While many good use cases are available, there is no “silver bullet” to convince each and every customer to invest into IoT/I4.0 immediately. The search is ongoing, but we cannot foresee when a real IoT/I4.0 killer application will be found. Quite possibly, it does not exist at all. However, there is no doubt about the added value of IoT/I4.0. IoT/I4.0 generates broad optimization potentials for many existing use cases, even without such specific “killer application”. IoT/I4.0 is an enablement technology for many use cases such as cloud computing. IoT will change our world long-term, independent of whether there will be a real killer application or not. But with such killer application, IoT/I4.0 adoption would be accelerated enormously.

Power to the IoT/I4.0 User

Another question that relates to above question is: Who will find such killer applications? Experience tells us that while providers and consultants often try hard to search for new use cases, it is often users who are successful in identifying good use cases themselves. This is not a new insight, and providers are well aware of that fact. Market changes will therefore have a clear direction towards IoT/I4.0 solutions with a much greater ease of use (“power to the user”). If any user (whether a techie or not) can collect, integrate and analyze IoT data and perform actions, based on these data, new use cases will automatically be identified faster – through try & error approaches.

Standardized IoT/I4.0 Solutions

During the next two years, identified use cases with a broad application will be launched very quickly as standard solutions. New innovative IoT solutions are often developed within individual projects and for one dedicated customer. Customized use cases can serve as blueprint for standard solutions. Some providers are already driving the fast standardization of IoT solutions for certain use cases. Such fast standardization generates enormous efficiency gains, based on economies of scale, and is therefore a decisive factor of success for providers.

I4.0 Production

For Experton Group, agile and customer-specific industrial mass production is not a vision of the distant future. While broad adoption of this concept is certainly still a dream in many industrial sectors, various areas of application will become a reality within the next two years – not in highly

complex, centralized mass production use cases, but within the context of new, smaller, decentralized production units that act close to the customer and are thus able to ensure the fast production and delivery of customer-specific products (for instance, high-value consumer goods).

IoT Platforms

Already today, IoT platforms play a highly relevant role as data "hubs" (for data integration, storage, analysis and visualization). Market offerings will not only include "full-service" IoT platforms with a fully integrated data, device and process management portfolio, but also new IoT integration platforms that serve as connectors for fast and easy connectivity between various data, device and process management solutions to help design a customer-specific or application-specific ("best of breed") IoT platform with all required functionality.

IoT/I4.0 Data Integration

Our world is and will remain heterogeneous, and therefore, integration will remain an ongoing digital issue, as is the case with the security topic. Common standards will only solve part of the problem. They lag behind the market's development and often multiple standards are existing in parallel. While the integration of heterogeneous data and applications is by no means a trivial task and is an obligatory aspect of the IoT/I4.0 universe, big data/analytics is the "optional" program, based on this mandatory task.

Users Evolve into IoT/I4.0 Providers

Increasingly, typical user organizations that have gathered IoT/I4.0 experience with in-house projects will attempt to offer this expertise and know-how on the external market, evolving from a typical IoT/I4.0 user to an IoT/I4.0 provider. They may offer their proprietary, specific technological IoT/I4.0 developments (for instance, in the machine & plant engineering sector) to other companies with similar needs and requirements or provide consulting and integration services to offer their internal IoT/I4.0 know-how to other companies. Bosch Software Innovation is a good example for this development.

Bimodal IoT/I4.0 Enterprises

Gartner has coined the term "bimodal IT", which refers to two separate speeds of IT – a stable IT backbone, combined with agile and flexible IT. This notion can be transferred to whole companies. The IoT segment is especially well suited to found fast, agile daughter companies, in contrast to inflexible corporate structures. In autumn 2015, Trumpf – a manufacturer of machine tools and laser technology – has entered this path and founded the AXOOM start-up. AXOOM is building up a

platform for software that helps plan production processes. This is Trumpf's active approach to evolve from a hardware vendor (of machines) to an operating system provider for these machines to a software vendor, becoming a bimodal enterprise.

IoT Ecosystems

In our highly connected economy, a company's size is not crucial anymore; rather, the company's network and ecosystem are key for success. While this development is certainly not limited IoT/I4.0, it will play a key role for the future development of this specific market. Within the next two years, IoT ecosystems will evolve and advance, often around IoT platforms, which will be complemented by additional microservices. A real network effect will, however, only be generated by ecosystems that combine a strong core solution (USP) with a strong business model (win-win) to attract more and more partners. Within the next few years, we will experience intense "coopetition" between competing IoT ecosystems.

IoT Security

Dedicated security concepts (such as Security by Design or Defense-in-Depth) are still rather scarce, especially in the IoT context, because developers tend to address the technical complexity (i.e., connectivity, component costs, energy consumption and space requirements), especially in case of small, mobile IoT devices, before the focus shifts to security issues. While security is important, it is mostly not a component of the first "minimal buyable product".

2.2.2 Solution Pioneers

With great interest Experton Group monitors new solution approaches in the German market that address the I4.0/IoT topic. This section shall present start-ups and other innovation leaders that we, as analyst house, perceive in the German market, although they do not fall under the market segments that have been analyzed within this benchmark, based on their current focus, and are therefore not analyzed in more detail within the quadrants/categories. However, Experton Group perceives these innovative solutions as potential forerunners for new market segments (quadrants) and therefore as highly relevant for our research. These vendors are regarded as "solution pioneers" that are breaking new ground and pursuing novel approaches.

Active Assist by Bosch

“Active Assist” by Bosch is a modular and flexible assembly assistance system. It connects assembly workplaces to digital assembly instructions to guide staff through individual assembly steps, based on freely configurable sensors and wizards. The assistance system uses RFID to identify the work piece and downloads the required work plan by connecting to the higher-level MES or ERP system. Digital assistance systems such as beamers that project work instructions and mark containers or pick-to-light modules provide workers the correct information to fulfil their task at any time. The language and working depth of instructions can be easily adjusted and the workplace can be resorted quickly, based on new specifications.

Vuforia Studio by PTC

PTC’s Thingworx is a platform that has been designed for the fast and easy usage for IoT applications (without programming skills), and PTC now pursues the same approach with the similarly complex augmented reality topic. Vuforia Studio by PTC is a tool that can be used to easily and quickly add augmented reality components to connected “things”. Vuforia Studio can be used to create new experiences when developing, operating and maintaining connected products. Vuforia Studio can use existing 3D objects from common 3D modelling tools and combine them with self-created animations and sequences and also with IoT sensor data (such as temperature or operating speed).

Industrial Data Space e.V.

The Industrial Data Space (IDS) is a virtual data room that supports the secure exchange and easy connection of data within business ecosystems, based on standards and common governance models. More than 30 renowned companies from Germany have already become active members of IDS e.V., including Fraunhofer Gesellschaft, Bosch, PwC, Allianz, Atos, Bayer, VW, Thyssenkrupp, Rewe and Schaeffler. IDS ensures that data owners – i.e., companies that want to make available their data for digital services – always have control over their data and can enforce compliance with their privacy and data protection policies, allowing partners within a value chain to access certain data by mutual agreement.

IoT Taster by AWS

The AWS IoT Taster is a simple WLAN device with a programmable button and can be used by developers as a first step into the IoT topic. The taster can be configured to count or track elements via clicks, call or alert people, initiate or stop processes or request services. It is even possible to give feedback with this device. For instance, the taster can be used to lock or unlock a vehicle with a click, open the garage door, call a taxi, call some person, contact customer service staff, remotely control household devices, do common housework or track medication intake or product usage.

ProGlove by Workaround

Munich-based start-up Workaround has developed a smart glove that has been designed to improve the efficiency and quality in the industrial production and the logistics sectors. ProGlove can replace bar code scanners and provides workers direct feedback, for instance, on whether they are using the correct tools and work pieces. ProGlove has already won several awards (Deutscher Gründerpreis, Wirtschaftswoche Neumacher Preis, Intel's Make It Wearable Challenge) and is included in the founder programs of Cisco, Deutsche Telekom and Intel.

2.3 Methodology

Figure 3: Experton Market Insight – sample

The “Experton Group Market Insight” quadrant results from our evaluation matrix and contains four segments where the providers are positioned accordingly:

Leaders

The "leaders" among the vendors have a highly attractive product and service offering and a very strong market and competitive position; they fulfill all requirements for successful market cultivation. They can be regarded as opinion leaders, providing strategic impulses to the market. They also ensure innovative strength and stability.

Product challengers

The “product challengers” offer a product and service portfolio that provides an above-average coverage of corporate requirements, but are not able to provide the same resources and strengths as the leaders regarding the individual market cultivation categories. Often, this is due to the respective vendor’s size or his weak footprint within the respective target segment.

Market challengers

"Market challengers" are also very competitive, but there is still significant portfolio potential and they clearly lag behind the "leaders". Often, the market challengers are established vendors that are somewhat slow to address new trends, due to their size and company structure, and have therefore still some potential to optimize their portfolio and increase their attractiveness.

Followers

“Followers” are still lacking mature products and services or sufficient depth and breadth of their offering, while also showing weaknesses and improvement potentials in their market cultivation efforts. These vendors are often generalists or niche players.

Rising Star

Rising Stars are mostly product challengers with high future potential. When receiving the "Rising Star" award, such companies have a promising portfolio, including the required roadmap and an adequate focus on key market trends and customer requirements. Also, the "Rising Star" has an excellent management and understanding of the local market. This award is only given to vendors or service providers that have made extreme progress towards their goals within the last 12 months and are on a good way to reach the leader quadrant within the next 12-24 months, due to their above-average impact and innovative strength.

2.4 Project Steps

The project “I4.0/IoT Vendor Benchmark 2017” analyzes the relevant service providers in the German market, based on a multi-phased research and analysis process, and positions these vendors based on Experton Group's “Market Insight” methodology. The project was divided into the following steps:

1. Definition of the “I4.0/IoT” target market, including all market segments
2. Survey of service providers and vendors on the defined market segments, based on a questionnaire
3. Expert interview with providers and users
4. Analysis and evaluation of services, service documentation and references

The project started in March 2016 with the first research phase to identify all market segments to be analyzed within this vendor benchmark, followed by the definition of all market segments by end of April, and the survey of vendors and service providers that are relevant players within the defined market segments, which started in May 2016. Expert interviews with vendors and users were conducted in parallel. This phase was completed in July 2016. Analysis, evaluation and preparation of the report were done from July to September 2016. Selected results will be presented to the media in October 2016.

3. INDUSTRIE 4.0/IoT VENDOR BENCHMARK 2017

RATING BY CATEGORIES

	Industrie 4.0/ IoT Vendor Benchmark										
Categories / Player	Industrie 4.0 Platforms	IoT Platforms	iPaaS IoT	IoT Starter Kits	IoT Connected Cars	IoT Logistics	IoT Smart Energy Management for Buildings	Industrial Big Data Analytics	Industrial Security	Industrial Big Data Dashboards/ Visualization	Number of Market segments
Accenture					L	L					2
Actian			F								1
Adaptris			F								1
Atos		L			L	L	L	L			5
AWS		MC		RS							2
Axiros		F									1
AXOOM	RS										1
Barracuda									F		1
Beckhoff	L										1
BEDM						L	PC	PC			3
Blue Yonder								L			1
Board								F			1
Bosch SI	L	L		PC		L	L	L			6
Capgemini					L	L		L			3
Caverion							L				1
CGI					F	L		F			3
Cisco								MC	L		2
Cognizant					PC	F		MC			3
CSC					PC			MC			2
Cumulocity		RS								PC	2
CyberArk									PC		1
Data Watch										PC	1
Datameer								PC		PC	2
Dell Boomi			F								1
Deutsche Telekom		L	L	L	L	L		L			6
Device Insight		PC				L	L	L		L	5
elastic.io			PC								1
Empolis								L			1
Eurotech		F									1
FIT	L										1
Fluid Ops								RS			1
FORCAM	L										1
Fortinet									F		1
FRITZ&MACZIOL						L					1
Fujitsu			MC								1
GE		F							L		2
Gefasoft	MC										1

L – Leader / PC – Product Challenger / F – Follower / MC – Market Challenger / RS – Rising Star

	Industrie 4.0/ IoT Vendor Benchmark										
Categories / Player	Industrie 4.0 Platforms	IoT Platforms	iPaaS IoT	IoT Starter Kits	IoT Connected Cars	IoT Logistics	IoT Smart Energy Management for Buildings	Industrial Big Data Analytics	Industrial Security	Industrial Big Data Dashboards/ Visualization	Number of Market segments
Green Pocket							MC				1
GreenCom Network							F				1
HCL					F	F					2
HEAT Software									RS		1
HPE		F			L			L			3
IBM		L	L	PC	L	L	L	L	L	L	9
Inconso						MC					1
Informatica			MC								1
Infosys					PC	PC					2
Intel/ McAfee									L		1
iTAC	L							PC			2
Kiwigrid							L				1
Microsoft		L	L	PC				L		L	5
MIOsoft								PC			1
MPDV	F										1
MuleSoft			MC								1
nemetris										RS	1
NorCom								F			1
NTT Data					PC	PC					2
Open Text										L	1
Oracle			F								1
Plex	PC										1
PTC		L						L			2
Qlik										F	1
QSC							RS				1
Relayr		F		L							2
Resolto								PC			1
SAP		MC	L					L		L	4
SAS								L			1
Scheer E2E			F								1
Siemens	MC						L		L		3
Software AG			MC								1
Sopra Steria						MC					1
Splunk								PC		PC	2
Symantec									MC		1
Synop Systems								MC			1
Tableau										PC	1
talend			F								1
TCS					F	PC					2
Tech Mahindra					RS	PC	PC				3
Tibco			L								1
UNITY					PC	RS					2
Vodafone					L	PC					2
Wipro					PC	PC		F			3

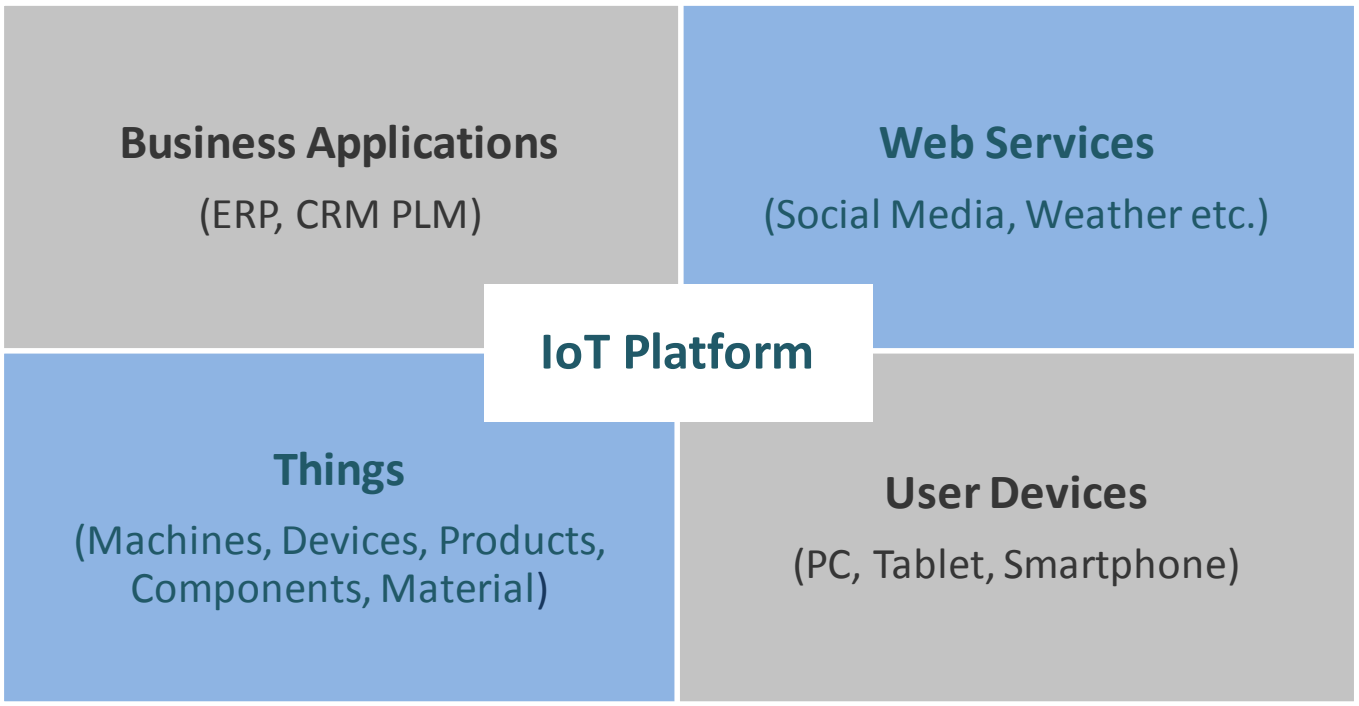
L – Leader / PC – Product Challenger / F – Follower / MC – Market Challenger / RS – Rising Star

Figure 4: Provider landscape

3.1 IoT Platforms

Introduction

Data & device management is the core functionality of an IoT platform to allow for connectivity between and the centralized management of distributed/decentralized things (devices, products, machines) and for processing (storing, integrating, analyzing and visualizing) their data. Common additional functionality includes big data analytics, application development and connectivity management. Basically, IoT platforms are no vertical, i.e., industry-specific, but horizontal platforms to connect data and things across multiple industries. IoT platforms connect four key elements: things, user devices, business applications and web services. Information is collected by things (machines, devices, products, components and materials) and prepared accordingly to visualize this information on user devices. Remote access to "things" via user devices is also possible. Other relevant aspects include integration with business applications (ERP, CRM or PLM) and external web services such as social media data or weather information.



Source: Experton Group, 2016

Figure 5: IoT platforms connect things with applications, user devices and web services

Key evaluation criteria and requirements for IoT platform providers can be summarized as follows:

- Breadth & depth of functionality
- USP
- Ecosystem consisting of system integrators, developers and sales partners
- Cooperation with other relevant IoT players and platforms
- Scalability
- Successful local customer projects

A look at the results of the current I4.0/IoT Vendor Benchmark reveals two developments:

First, our expectations that many new IoT platforms would enter this market segment have not been fulfilled. More providers are exiting than entering this segment. Five companies – Capgemini, CSC, Cognizant, QSC and Intel – have exited this market, compared to four new players, namely SAP; AWS, GE and Relayr. Other players that had market entry plans last year have stayed away and not entered the market at all. In summary, we can say that market consolidation is occurring much faster than expected.

Second, it is important to understand what differentiates the leaders in this quadrant from other players. This question is closely connected to the following question: “What are the long-term success factors for IoT platforms?” For Experton Group, those who will become established players in the market are not necessarily the providers with the best IoT platform technology, but those who can establish a partner ecosystem around their own IoT platform. This is where today’s leaders are ahead of their competition. They have understood that partnerships with other IoT players are key to success. To scale their own IoT platform, providers need a whole network of system integrators and independent developers that can build their solutions on this IoT platform, to the extent that they need to be willing to engage in close cooperation with direct competitors to combine their own strengths with those of the competition, for the customers’ benefit. We observe this development, especially among large players such as Bosch, PTC, Microsoft, GE and Deutsche Telekom. All providers are attempting to find their place within the overall market structure. Claims are staked out, and “coopetition” is the order of the day. Cumulocity, a relatively small player, excels in this play of market forces around cooperations and partnerships and has therefore received the “Rising Star” award.

Evaluation of Providers

Experton Group has identified 15 providers of IoT platforms in the German market. Six out of these providers were positioned in the leader quadrant:

- Atos
- Bosch SI
- Deutsche Telekom
- IBM
- Microsoft
- PTC

Cumulocity has been identified as the "Rising Star" of this segment.

Figure 6: Quadrant for IoT platforms

Category: IoT Platforms

Atos

Strengths:

- The functional strengths of the IoT platform portfolio include complex event processing and the enormous degree of scalability (which is demonstrated through large local references).
- There is a strong industry-specific focus – the horizontal Connected Living Enabler platform serves as basic IoT platform for multiple vertical IoT platforms around home applications, vehicles and the manufacturing industry (connected vehicle, connected home, industrial IoT platform).
- Many local references demonstrate Atos' strong IoT footprint in the German market.
- Atos demonstrates a strong commitment within local initiatives, including the Industrial Data Space for the secure data exchange between IoT platforms.

Challenges:

- The portfolio of IoT platforms (meanwhile completely under the Worldline brand) is rather complex and unclear. A simpler structure of this offering would be useful for external presentation purposes and Atos is already planning to improve the structure accordingly.
- Experton Group has observed more and more cooperations between IoT platform providers to benefit from mutual strengths. No such development can be observed at Atos.
- As of to date, Atos' IoT platforms are not open to external system integrators or application developers. Such openness would be useful to increase the degree of adoption in the market.

Trend assessment:

POSITIVE

Advisor Statement

"The functional strengths of the Atos IoT platform portfolio include complex event processing and the enormous degree of scalability."

Category: IoT Platforms

Bosch SI

Strengths:

- The USP of the Bosch IoT Suite is the comprehensive device management functionality that is unrivalled by any other competitor (Bosch IoT Remote Manager, Bosch IoT Things, Bosch IoT Rollouts, Bosch IoT Hub).
- Bosch is perceived as an IoT/I4.0 thought leader in the German market (including the provider's annual Connected World top event in Berlin) and pursues a dual strategy to be positioned as a "lead user" as well as a "lead provider".
- Bosch has good local references and good access to German customer organizations.
- Cooperation with PTC is a targeted approach to strengthen the visualization and fast application development capabilities of the Bosch IoT Suite. The provider is preparing to engage in additional cooperations.
- Bosch has already established a strong ecosystem of partners and system integrators in Germany.

Challenges:

- So far, developers are not provided open access to the Bosch IoT Suite and no marketplace has been set up for developed applications.

Trend assessment:

POSITIVE

Advisor Statement

"The USP of the Bosch IoT Suite is the comprehensive device management functionality that is unrivalled by any other competitor."

Category: IoT Platforms

Cumulocity (Rising Star)

Strengths:

- During the last few years, Cumulocity has gathered a lot of experience with IoT platforms; the provider has already implemented 100 IoT customer projects (many of them in the local market) and has strong local reference customers (Deutsche Telekom, Dürkopp Adler, Certuss).
- Deutsche Telekom is a strong local partner and multiplicator for the Cumulocity IoT platform.
- Cumulocity's strengths include the scalability, the new cockpit for dashboards, real-time analytics and easy integration of field bus devices (Cloud Fieldbus).
- Cumulocity pursues a targeted approach to enhance the functionality of their own IoT platform through partnerships, including connectivity with the Jasper Control Center for connectivity management, Zapier for SaaS integration (iPaaS) with ERP and CRM applications and the Astea field service management solution.

Challenges:

- Cumulocity's awareness in the local market is too low.
- The provider should strengthen its involvement with starter kits to support their own developer community (2,500).
- Cumulocity is a small company (50 employees) that must directly compete with large players.

Trend assessment:

POSITIVE

Advisor Statement

"Cumulocity's strengths include the scalability, the new cockpit for dashboards, real-time analytics and easy integration of field bus devices."

Category: IoT Platforms

Deutsche Telekom

Strengths:

- Deutsche Telekom's Multi-IoT Service Platform pursues a great vision. Based on the best-of-breed approach, customers may access multiple IoT platforms by partner companies, depending on the individual use case, while being provided a modular one-stop-shopping (E2E) approach.
- Cooperation with platform partners allows Deutsche Telekom to access these partners' developer ecosystem and their industrial analytics know-how.
- Deutsche Telekom's functional strengths within this multi-IoT platform approach include connectivity and data management (scalability, performance, security, analytics, machine learning) and their comprehensive consulting and system integration portfolio.
- Deutsche Telekom has many renowned customer references in the German market for their IoT platform.

Challenges:

- While the "Cloud der Dinge" ("Cloud of Things") platform is already available, extension of the IoT platform with additional platform partners has not occurred yet (and is planned for Q4 2016).
- Marketing of the Multi-IoT Service Platform (MISP) has not been initiated yet.
- Deutsche Telekom should build up an ecosystem of system integrators around their Multi-IoT Platform.

Trend assessment:

POSITIVE

Advisor Statement

"Deutsche Telekom's Multi-IoT Service Platform (MISP) pursues a great vision; based on the best-of-breed approach, customers may access multiple IoT platforms by partner companies, depending on the individual use case, while being provided a modular one-stop-shopping (E2E) approach."

Category: IoT Platforms

IBM

Strengths:

- The strength of the IBM IoT platform is the combination of analytics capabilities (Watson IoT) with the application development environment (Bluemix IoT).
- The Watson IoT developer ecosystem is growing continuously and is currently gaining momentum.
- IBM was among the IoT visionaries. Already in 2008, IBM's Smarter Planet vision had a focus on digitized, connected and smart things (instrumented – interconnected – intelligent).

Challenges:

- The number of local Watson IoT references is very limited.
- Additional cooperations with other IoT platform providers are recommended; currently, IBM is only engaged in a Cisco (and, therefore, Jasper) cooperation.
- While IBM was among the IoT visionaries, the provider is not perceived as an IoT thought leader in the Germany market anymore.
- IBM's IoT focus is mostly on the analytics capabilities, while data integration capabilities are missing out.

Trend assessment:

POSITIVE

Advisor Statement

"The strength of the IBM IoT platform is the combination of analytics capabilities (Watson IoT) with the application development environment (Bluemix IoT)."

Category: IoT Platforms

Microsoft

Strengths:

- The Azure IoT Suite features broad functionality and provides modules for device management (IoT hub), analytics (machine learning), real-time analytics (stream analytics), visualization (power BI) and event processing (notification hub).
- No other vendor can provide such a strong developer and ISV ecosystem as Microsoft on its Azure Cloud.
- Deutsche Telekom and GE are two strong cooperation partners for the IoT platform business.

Challenges:

- So far, only few partners in Germany are IoT-certified (among them Beckhoff).
- The number of local references (Thyssen, Kuka) is still limited, and the Azure IoT Suite will not be operated from a data center in Germany before end of September 2016.
- The provider must strengthen their strategic focus on the Azure IoT Suite. Currently, it seems that the Azure IoT Suite is just an add-on to the Azure cloud platform and that Microsoft does not have a strong focus on this solution.

Trend assessment:

POSITIVE

Advisor Statement

"No other provider has such a strong ecosystem of developers and system integrators as Microsoft – the challenge is to evolve and advance this ecosystem towards IoT."

Category: IoT Platforms

PTC

Strengths:

- PTC Thingworx' USP is the fast and easy creation of IoT applications and dashboards, also without in-depth IT skills and long learning phases.
- The Vuforia (augmented reality) and Kepware (device connectors) acquisitions allow the provider to build up additional USPs for Thingworx, compared to the competition.
- Thanks to the Thingworx USP, Thingworx has become an important cooperation partner for other IoT platforms such as the Bosch IoT Suite and GE Predix.
- Based on their PLM history, PTC has good access to German industrial customers and has good local reference projects such as Heidelberger Druck, Carl Zeiss, Phillips or Audi.
- PTC is perceived as one of the IoT thought leaders in the market, which is demonstrated through annual customer events in Germany and publications by PTC CEO Jim Heppelmann in cooperation with Michael Porter in the Harvard Business Manager magazine.
- Thingworx has an existing ecosystem of developers and system integrators. More than 200 apps are available through a marketplace.

Challenges:

- While PTC is very innovative, these are no self-developed innovations, but are mostly based on acquisitions.
- The many acquisitions (Thingworx, Axeda, Vuforia, Kepware) require a lot of internal integration efforts.
- Cloud infrastructure resources in Germany would be of advantage.

Trend assessment:

POSITIVE

Advisor Statement

"PTC Thingworx' USP is the fast and easy creation of IoT applications and dashboards."

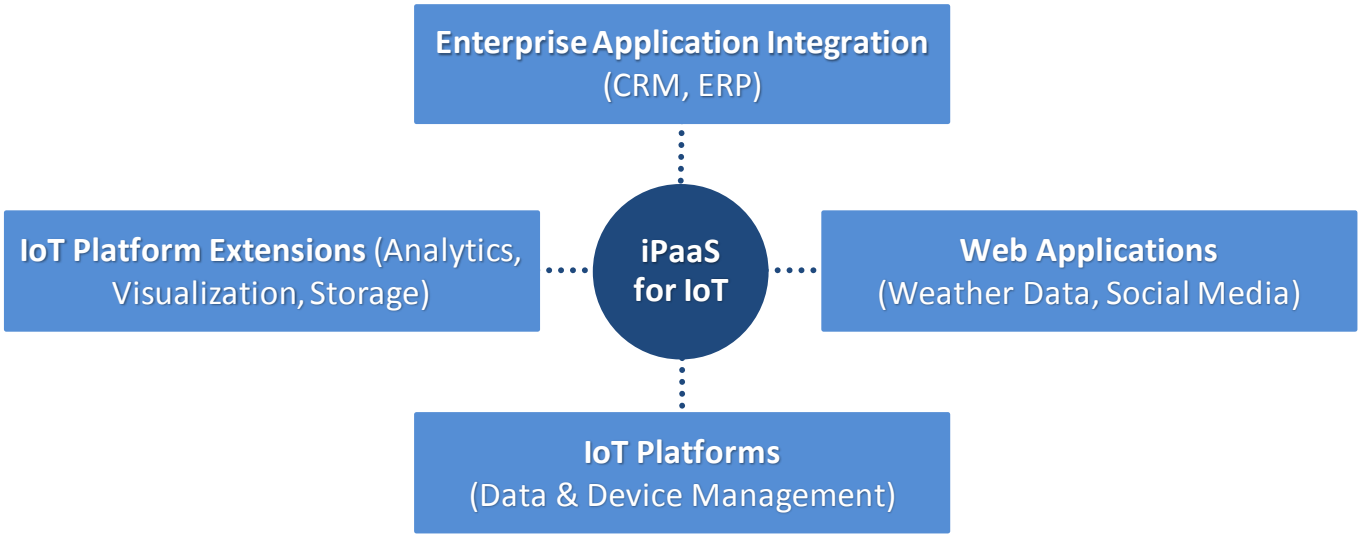
	IoT Platforms								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩ ⇔ ⇧
Atos	0	0	0	0	0	0	0	0	⇧
AWS	-	-	0	0	0	0	0	0	⇧
Axiros	-	-	-	-	-	-	-	-	⇔
Bosch SI	0	+	0	0	+	+	+	+	⇧
Cumulocity	0	0	0	0	0	-	0	0	⇧
Deutsche Telekom	0	0	0	0	0	0	0	-	⇧
Device Insight	0	0	0	0	-	-	-	0	⇧
Eurotech	-	-	-	-	-	-	-	-	⇔
GE	0	0	-	-	0	0	-	-	⇧
HPE	0	0	-	-	-	-	-	-	⇔
IBM	0	0	0	0	0	0	0	0	⇧
Microsoft	0	0	0	0	+	+	0	0	⇧
PTC	+	+	0	0	+	+	+	0	⇧
Relayr	0	0	-	-	-	-	-	-	⇔
SAP	-	-	0	0	0	0	0	0	⇧

Figure 7: Overview of providers of IoT platforms with trend forecast

3.2 iPaaS for IoT

Introduction

iPaaS for IoT solutions are useful add-ons to IoT platforms to ensure easy and fast integration of IoT platforms with other data sources and applications. iPaaS for IoT solutions support IoT platforms with connectors and adapters in three concrete use cases: the fast and easy integration of IoT platforms with business applications (mainly cloud-based) such as CRM or ERP; the fast and easy integration of data from web applications (e.g., weather data, social media data) with IoT platforms; and the fast and easy functional extension of IoT platforms, for instance, through specific tools for advanced data analysis or data visualization. iPaaS for IoT applications also have the future potential to compete with IoT platforms in cases where such applications can orchestrate multiple applications for data and device management into customized IoT platforms.



Source: Experton Group, 2016

Figure 8: iPaaS for IoT solutions support IoT platforms to ensure fast and easy application integration

Key evaluation criteria and requirements for iPaaS for IoT solution providers can be summarized as follows:

- Connectors to IoT platforms and other relevant IoT applications
- Connectors to key ERP and CRM applications
- Connectors to analytics applications
- Connectors to visualization tools
- Connectors to web applications (weather data, social media, cloud storage)
- Usability/ease of use

This is the first analysis of iPaaS for IoT solutions within the I4.0/IoT Vendor Benchmark. Interestingly, many iPaaS providers do not address IoT topics yet, which is reflected in their offerings that lack connectors for direct links to IoT platforms. On the other hand, many of these providers are well established and provide many connectors for integrating business applications (ERP, CRM), web applications (social media, weather data, cloud storage) and add-on applications with IoT platforms, for instance, for advanced data analysis and data visualization purposes. To further penetrate the IoT market segment, established iPaaS providers are challenged to build up additional connectors for IoT platforms to be included into their portfolio; as of to date, such connectors are still scarce. Besides TIBCO, market leaders in this segment include mainly large players such as IBM, Microsoft, SAP and Deutsche Telekom, who offer not only their own iPaaS portfolio, but also their own IoT platform and are therefore already able to integrate these two components.

Evaluation of Providers

Experton Group has identified 16 relevant iPaaS for IoT providers for the German market. Five out of these providers were positioned in the leader quadrant:

- Deutsche Telekom
- IBM
- Microsoft
- SAP
- TIBCO

Figure 9: Quadrant for iPaaS for IoT

Category: iPaaS for IoT

Deutsche Telekom

Strengths:

- Based on their technology partnership with Informatica and their own IoT platform, Deutsche Telekom can offer a high-quality one-stop-shopping IoT and iPaaS solution.
- The growth path is good, for customers can start with simple IoT use cases on the provider's proprietary IoT platform and leverage iPaaS to master the complexity resulting from increased connectedness with other applications.
- Deutsche Telekom provides 125 connectors, including for CRM (Salesforce, Oracle, Microsoft, SugarCRM), ERP (SAP, Microsoft, Oracle, Netsuite), cloud platforms (AWS, MS Azure) and analytics & visualization (Hadoop, Tableau, MongoDB, IBM DB, Oracle DB).
- The clear IoT focus, the local cloud delivery strength, good customer access, sales and support capabilities are a good basis for expanding the IoT business.

Challenges:

- As of to date, Deutsche Telekom does not build their own connectors, which would, however, be a good approach to build up another USP and to generate more added IoT value, compared to Informatica.
- Only few local reference customers could be named (the iPaaS offering is relatively new).
- iPaaS is a mere add-on business within the provider's comprehensive cloud portfolio and has not much sales and marketing focus.

Trend assessment:

POSITIVE

Advisor Statement

"Deutsche Telekom can optimally combine iPaaS and IoT, based on their strong solution partnerships."

Category: iPaaS for IoT

IBM

Strengths:

- IBM can offer an IoT platform and iPaaS from one single source; only few providers are currently able to offer such one-stop-shopping approach.
- The growth path is good, for customers can start with simple IoT use cases on the provider's proprietary IoT platform and leverage iPaaS to master the complexity resulting from increased connectedness with other applications.
- The connector for Servicemax has IoT capabilities, since Servicemax is an IoT-enabled service management platform for the customer service (with interface for Thingworx by PTC).
- IBM provides about 30 connectors, including to ERP (SAP, Microsoft, Netsuite), CRM (Salesforce, Microsoft, Oracle, SugarCRM) and customer service (Servicemax) applications.

Challenges:

- Currently, no iPaaS connectors to IBM's proprietary IoT platform are available.
- So far, no marketplace and no connectors to key services/providers such as MS Azure, or AWS are available.
- IBM's sales and marketing focus on iPaaS is limited, since iPaaS cannibalizes the provider's own middleware business.

Trend assessment:

POSITIVE

Advisor Statement

"IBM can offer an IoT platform and iPaaS from one single source; only few providers are currently able to offer such one-stop-shopping approach."

Category: iPaaS for IoT

Microsoft

Strengths:

- Microsoft can offer an IoT platform and iPaaS from one single source; only few providers are currently able to offer such one-stop-shopping approach.
- The growth path is good, for customers can start with simple IoT use cases on the provider's proprietary IoT platform and leverage iPaaS to master the complexity resulting from increased connectedness with other applications.
- Microsoft provides ten connectors for the integration of on-premise data/applications (Microsoft SQL Server, Oracle-DB, Oracle E-Business Suite, SAP, Siebel, Peoplesoft) with the MS Azure Cloud.
- The strong customer base of the MS Azure cloud platform bears large potentials for increasing the adoption of the Azure IoT Suite, combined with Azure BizTalk Services.

Challenges:

- The scope is very limited (only on-premise & MS Azure) and there is no focus on integrating heterogeneous cloud or IoT landscapes.
- There is a lack of connectors to other IoT platforms and key cloud services such as Salesforce or AWS.
- Only few connectors are available and we do not know of any related development roadmap.

Trend assessment:

POSITIVE

Advisor Statement

"Based on the Azure IoT Suite and Azure BizTalk Services, Microsoft can provide an integrated iPaaS and IoT offering."

Category: iPaaS for IoT

SAP

Strengths:

- SAP connects HANA-based analytics with the SAP application universe, also within the context of IoT use cases.
- SAP has a clear industry focus to address the needs of industrial customers and a large customer base within the manufacturing industry.
- The provider paves the way for SAP users to switch to the cloud through the hybrid integration of SAP applications, connecting SAP cloud services (CRM, ERP, HR) with each other and with SAP on-premise solutions.
- SAP's strong customer base bears large potentials for IoT connectors.

Challenges:

- Only very few connectors are available and there are no connectors to IoT platforms at all.
- No connectors to other key cloud services such as Microsoft, Oracle, Salesforce or AWS are available.
- There is no roadmap for connectors for heterogeneous cloud or IoT use cases.

Trend assessment:

POSITIVE

Advisor Statement

"SAP connects HANA-based analytics with the SAP application universe, also within the context of IoT use cases."

Category: iPaaS for IoT

TIBCO

Strengths:

- TIBCO, as an industry-oriented big data/analytics integration specialist around ERP, CRM and analytics and has great IoT development potentials. The provider has their own analytics, dashboard and event processing/business process management tools.
- TIBCO is vendor-agnostic and provides more than 100 connectors, including connectors to ERP (SAP, Oracle, Netsuite), CRM (Salesforce, Oracle Siebel, SugarCRM, Microsoft Dynamics CRM, SAP CRM), cloud platforms (AWS, MS Azure) and analytics (AWS, Hadoop).
- TIBCO has industry-specific know-how and renowned industrial customers (Deutsche Bahn, Siemens, Lufthansa) as well as strong global and local partners (e.g., Atos in Germany).

Challenges:

- While no strategic focus on IoT can be observed and there is a lack of connectors to IoT platforms, large potentials exists.
- The provider's awareness as I4.0/IoT and data integrator/iPaaS provider in the local market could be improved.
- TIBCO does not operate their own local data center.

Trend assessment:

POSITIVE

Advisor Statement

"TIBCO is an industry-oriented big data/analytics integration specialist – the provider is now challenged to leverage the related enormous IoT development potential accordingly."

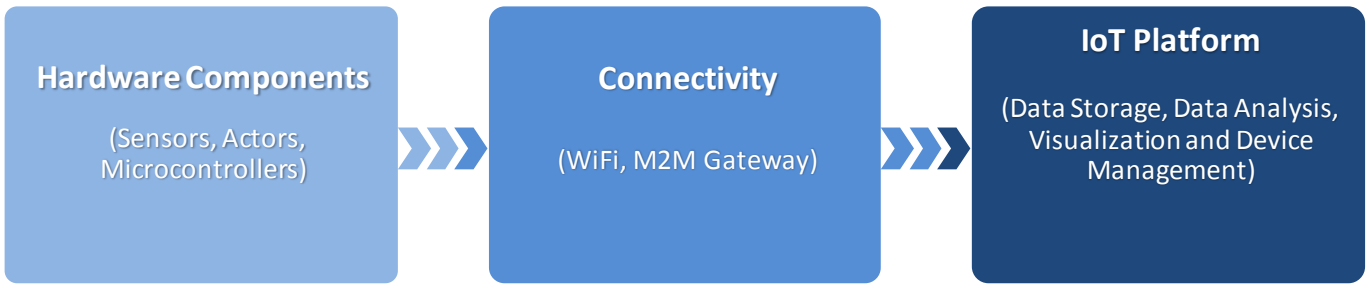
	IPaaS for IoT								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩⇔⇧
Actian	0	-	0	0	-	-	-	0	⇔
Adaptris	0	-	0	0	-	-	0	0	⇧
Dell Boomi	0	-	0	0	-	0	0	0	⇧
Deutsche Telekom	0	0	+	0	0	0	0	0	⇧
elastic.io	0	0	0	0	-	-	-	-	⇧
Fujitsu	0	-	0	-	0	0	0	0	⇔
IBM	0	0	+	0	0	+	0	+	⇧
Informatica	0	-	0	+	0	0	0	0	⇔
Microsoft	0	0	0	0	0	+	0	+	⇧
MuleSoft	0	-	0	0	0	-	0	0	⇧
Oracle	0	-	0	-	0	0	-	0	⇔
SAP	-	0	0	0	+	0	0	+	⇧
Scheer E2E	0	-	0	0	-	0	0	0	⇧
Software AG	-	-	0	0	0	0	0	+	⇔
talend	0	-	0	0	-	-	-	-	⇔
TIBCO	0	0	0	+	0	0	0	0	⇧

Figure 10: Overview of providers of iPaaS for IoT solutions with trend forecast

3.3 IoT Starter Kits

Introduction

IoT starter kits provide a fast, easy and practical entry-level approach to IoT. They enable independent developers as well as technically savvy midmarket businesses to quickly build their own IoT solutions (often for initial test purposes). On the hardware side, IoT starter packs consist of several sensors and actors that are connected to a small microcontroller. WLAN or mobile communications are used to connect them with an IoT platform to collect, prepare and visualize device data. Ideally, it is not only possible to collect and visualize data, but to also activate actors to (remotely) control devices.



Source: Experton Group, 2016

Figure 11: Core components of an IoT starter kit

Key evaluation criteria and requirements for providers of IoT starter kits can be summarized as follows:

- Number and kind of sensors and actors
- Capabilities of the connected IoT platform (as back-end for data visualization, analysis and application development)
- Pricing structure for the three core components
- Connectivity options
- Local market access
- Level of awareness of the solution
- Sales channels & marketing

IoT starter kits have been included for the first time into Experton Group's I4.0/IoT Vendor Benchmark. Those who perceive IoT starter kits as interesting for hobbyists (B2C) only are certainly not doing them justice. While they are still in their infancy, their potential should not be underestimated, also for B2B environments. They reduce complexity for users enormously, especially within the context of initial testing purposes. Such starter kits are also a useful concept for IoT platform providers to help them build up an ecosystem consisting of independent developers around their own platform, but they could also cause a vendor lock-in, for once a customer has accumulated data on a certain IoT platform and has become familiar with the respective analytics and visualization functionality, it is highly probable that this user will stay with this IoT platform and implement additional use cases. The multitude of available sensors is currently very limited, but more and more types of sensors will be offered within IoT starter kits in the future. Certainly, Relayr with their "Wunderbar" IoT starter kit is the innovator in this market segment. Deutsche Telekom is also launching their own starter kit and will be Relayr's greatest competitor. Other relevant providers such as Bosch SI, Microsoft, AWS and IBM are also waiting in the wings and will launch their IoT starter kits in the German market during the next few months.

Evaluation of Providers

Experton Group has identified 6 relevant providers of IoT starter kits for the German market. Two out of these providers were positioned in the leader quadrant:

- Deutsche Telekom
- Relayr

AWS has been identified as the "Rising Star" of this segment.

Figure 12: Quadrant for IoT starter kits

Category: IoT Starter Kits

AWS (Rising Star)

Strengths:

- 10 IoT starter kits are already available, offered by various partners and directly connected to the AWS IoT platform.
- AWS is starting from scratch, but is advancing at breakneck speed. This is also true for the functional scope of the AWS IoT platform and the number of IoT starter kits.
- AWS' Amazon shop is the perfect sales channel for IoT starter kits.

Challenges:

- All AWS starter kits are only available in the US. Amazon Germany only offers starter kits that are linked to competitive IoT platforms (Azure and Relayr).
- Due to the WLAN connectivity, the starter kit is more suitable for applications such as tracking or condition monitoring within the smart home/smart building sector.
- AWS' awareness in the IoT starter kits segment is still low in the German market.
- The device management functionality of the AWS IoT platform is still being developed.

Trend assessment:

POSITIVE

Advisor Statement

"10 IoT starter kits by AWS are already available and connected to the AWS IoT platform – however, availability is limited to the US."

Category: IoT Starter Kits

Deutsche Telekom

Strengths:

- The package for the easy entry into the Internet of Things consists of a gateway, standard sensors (GPS data, acceleration/shock, temperature and humidity), a SIM card with data tariff and access to Deutsche Telekom's "Cloud of Things".
- Based on mobile M2M connectivity, tracking and condition monitoring use cases can also be implemented for vehicles, transported goods and other mobile devices (a real USP within the context of this benchmark).
- Deutsche Telekom covers the whole value chain, from hardware starter kit and M2M connectivity to the IoT back-end in the cloud.

Challenges:

- The "Cloud of Things Starter Kit" for the midmarket segment is still being prepared for market launch. First pilot projects were initiated in July 2016. The offering will not be available in the German market before the second half of 2016.
- The mobile M2M connectivity does not only incur initial cost, but also recurring cost for the starter kit. The monthly fee covers mobile communications and the usage of the platform service and storage space for data in the cloud.
- In a first step, the starter kit is only sold directly through Deutsche Telekom. Additional sales channels (e.g., Amazon) would support faster distribution in the German market.

Trend assessment:

POSITIVE

Advisor Statement

"Based on the mobile connectivity, Deutsche Telekom's Cloud of Things Starter Kit is the only IoT starter kit that has been designed for mobile applications."

Category: IoT Starter Kits

Relayr

Strengths:

- Relayr as product innovator launched their Wunderbar IoT Starter Kit as early as 2014 in the German market. Before the market launch, the player completed a successful funding campaign on the Dragon Innovations hardware crowd funding platform and has secured 120% of required financing.
- Six sensors/actor modules such as for sounds, light, distance, temperature and movement, are grouped around a Wi-Fi master module,
- Relayr has a growing ecosystem consisting of strong partners in the German market, including Bosch, Accenture, Cisco, AWS, Intel and Conrad.
- Relayr's Wunderbar "chocolate bar" already enjoys a high degree of awareness in the German market and became code_n Award Winner in 2015.

Challenges:

- Due to the WLAN connectivity, the starter kit is more suitable for applications such as tracking or condition monitoring within the smart home/smart building sector.
- As a small Berlin-based start-up, Relayr's financial resources are limited and the provider will have difficulties to compete with the large players in this market segment.
- It seems no product advancements for Wunderbar have been implemented since market launch in 2014, which indicates that customers' interest is not very high.

Trend assessment:

NEGATIVE

Advisor Statement

"As an IoT pioneer, Relayr launched their Wunderbar IoT Starter Kit as early as 2014 – but not much progress has been made since then."

	IoT Starter Kits								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩ ⇔ ⇧
AWS	0	+	-	-	-	0	-	-	⇧
Bosch SI	0	-	0	0	-	0	-	0	⇧
Deutsche Telekom	0	0	+	0	0	0	0	0	⇧
IBM	0	0	-	+	-	0	-	-	⇔
Microsoft	0	0	-	0	-	0	0	-	⇔
Relayr	+	-	-	0	0	-	0	0	⇩

Figure 13: Overview of providers of IoT starter kits with trend forecast

3.4 Industrial Big Data Analytics

Introduction

The vision of one million of electric vehicles in Germany by 2020 will certainly not come true, despite the 3000-Euros “premium” for newly bought e-cars. The vision has remained a hallucination. On the other hand, the good news is that there are many other high-tech sectors in Germany that bear significant development potential. For instance, there are many “hidden champions” in Germany, i.e., global and technological leaders, mostly with a focus on machine & plant engineering and robotics.

Thus, it made sense to use Industrie 4.0 – with its vision of the automated factory and self-configuring production systems (CPS, cyberphysical systems) – to create a new initiative for the German economy. Also, Industrie 4.0 has an inherent connection to the Internet of Things, constituting a good counter-pole for the Internet of Things trend topic that has its roots in the US; both topics mutually drive each other.

More and more devices in the manufacturing industry and other sectors are equipped with an IP address and deliver data to the business IT via TCP/IP. Respective IT systems work with business intelligence and business analytics software, which has formerly been used for key performance indicators. These solutions are not always suited for the huge amounts of machine data, and so, BI/BA solutions were advanced and evolved accordingly to enable them to process these large data volumes.

While “big data” mainly refers to unstructured or semi-structured data, data from industrial systems and machines are normally very well structured, often too well, considering, for instance, the huge data packet that might have to be transferred to communicate a temperature difference, as IT expert Gunther Dueck has described in one of his speeches.

In cases where machine and system data are connected with enterprise IT, the respective software can be named an industrial big data analytics solution. Today, where the market is still immature and in its infancy, information delivered by sensors, control units and machines often must be translated for the IT systems. The current challenge is to prepare these data streams for analysis, which can be done via adapters (also called connectors, agents etc.). Typically, these adapters transmit machine-readable data into traditional systems such as databases or databases that are integrated with an ERP system or MES to conduct various analysis of these data, which today often must be prepared by specialists.

The complexity of the industrial big data analytics market is increasing, which is a challenge for providers to keep up with their solutions. Some new vendors are entering this segment, coming from the traditional business intelligence and the big data market and enhancing their offering to also include machine data; other new players include providers from the automation technology segment and related markets that are connecting their systems gradually with business IT systems.

This benchmark category evaluates analytics solutions and analytical databases. These big data analytics products, solutions and services are provided by vendors or qualified full-service providers

with a dedicated focus on processing industrial machine and facility data and on analyzing large, complex and unstructured data volumes (big data analytics). As of today, analytics for predictive maintenance is the most important IoT&I4.0 use case. Increasingly, the focus is also on influencing the data source, i.e., the devices that have delivered the analyzed values. Slowly, first solutions are emerging that can be used to influence production lines directly out of respective analyses.

Key evaluation criteria or requirements for providers of industrial big data analytics within this year's benchmark included proof of practical examples for big data analyses with machine data, forecasts and analyses that go beyond pure monitoring, for instance, to find causes for variations in yields. Additional criteria included the following (selection):

- Strategy, vision and technology leadership
- Product features, depth of portfolio and roadmap
- USP, skills, architecture and solution design
- Service, support and additional solutions
- Client experience (portfolio quality from the customers' perspective) with customer satisfaction ratings and feedback
- Market position and market presence
- Revenues and growth rates
- References and customer projects
- Image and degree of awareness
- Innovation
- Stability, financial and organizational dependencies of the German organization
- Advertising, PR, marketing communications, sales marketing and sales
- Channel and partnerships

Remarkable changes, compared to the first industrial big data analytics analysis, are newcomers such as iTAC, fluidOps and Cisco (due to the Parstream acquisition).

Also, some companies, including SAS, Capgemini and Synop, achieved significantly higher competitive strength ratings. For instance, Atos has improved their position and joined the group of leaders.

Empolis, the "Rising Star" of the previous years, has consistently pursued their approach and was able to achieve a position among the leaders of this segment. The provider's organic growth and an acquisition have also contributed to this leadership position.

Some evaluation criteria received a stronger or lower weighting, depending on the market development, which has resulted in changes of these vendors' position; but except for the providers already mentioned, no other providers have left their respective quadrant, for instance, have been downgraded into the "follower" quadrant.

Evaluation of Providers

Experton Group has identified 28 relevant providers of **industrial big data analytics solutions** for the German market. 13 out of these providers were positioned in the leader quadrant:

- Atos
- Blue Yonder
- Bosch SI
- Capgemini
- Deutsche Telekom
- Device Insight
- Empolis
- HPE
- IBM
- Microsoft
- PTC
- SAP
- SAS

fluidOps is the Rising Star of this segment.

Figure 14: Quadrant for industrial big data analytics

Category: Industrial Big Data Analytics

Atos

Strengths:

- Atos has developed a broad and comprehensive Industrie 4.0 architecture; including the analytical "Codex" components.
- Codex can be used for all kinds of analyses that also deliver approaches for business process improvements.
- The company enjoys a strong position in Germany.

Challenges:

- In Germany, where Industrie 4.0 is an important aspect, Atos could improve their position even further by increasing their focus on the digital factory, cyber-physical systems and completely novel, autonomous, data-driven production systems.
- The company could bundle the existing know-how within a competence center, which would support respective targeted customer communications.
- Due to the high share of open-source components, the provider is dependent on development work that is outside Atos' direct control.

Trend assessment:

POSITIVE

Advisor Statement

Atos' Codex development has greatly improved this IT service provider's position."

Category: Industrial Big Data Analytics

Blue Yonder

Strengths:

- Blue Yonder is among the big data pioneers in Germany and has enhanced and advanced respective ideas at an early point in time to also include Industrie 4.0 and IoT.
- Blue Yonder is a predictive analytics pioneer.
- Aspects such as the provider's reputation and international as well as national awards have also contributed to the positive rating.

Challenges:

- Compared to the retail and other big data applications, Blue Yonder could develop larger market shares in the industrial analytics sector in the target geography of this benchmark.
- More public and independent references on interesting PoCs and the numerous industrial analytics pilot projects in Germany would be of advantage.
- An independent service and consulting offering would increase the company's attractiveness even further.

Trend assessment:

NEUTRAL

Advisor Statement

"Blue Yonder 's positive ratings within this benchmark are also due to the provider's role as a pioneer in the predictive analytics segment. If used correctly, the solution can also be leveraged to forecast the behavior of industrial facilities."

Category: Industrial Big Data Analytics

Bosch SI

Strengths:

- The company is a pioneer of production data analytics.
- The company plays a research role within the Bosch group, and therefore, the solutions are very advanced.
- The provider's solutions are perceived as a tested and proven offering and are frequently used, mostly by internal users.

Challenges:

- Bosch SI should drive technologies that actively trigger machines and facilities, based on industrial big data analyses.
- The independent and specific industrial analytics training offering is still being developed.
- Prototypical technologies for Industrie 4.0 use cases could have an even stronger impact in the market as products and services.

Trend assessment:

POSITIVE

Advisor Statement

"Within this segment, Bosch has again benefitted from their role as a research company with a high level of innovation."

Category: Industrial Big Data Analytics

Capgemini

Strengths:

- Capgemini's consulting offerings covers large parts of the industrial digitization.
- The company conducts its own research and user analyses on this topic.
- The industrial big data analytics know-how was developed over a long time.

Challenges:

- The transparency of the scope of offerings, value propositions and pricing could be improved.
- Existing know-how and services for big data analytics could be formulated more clearly.
- Near-term, many more local data center capacities might be required for large data volumes.

Trend assessment:

NEUTRAL

Advisor Statement

"Capgemini leverages their experiences gained with customers from the industrial sector and relating to key performance indicators to apply them to industrial analytics, based on suitable software tools and services."

Category: Industrial Big Data Analytics

Deutsche Telekom

Strengths:

- The company has demonstrated significant growth during the last twelve months.
- The company has numerous references and hands-on use cases for users to help them develop their own use cases accordingly.
- Based on the structure of the whole company group, Deutsche Telekom provides an extraordinarily comprehensive offering from one single vendor.

Challenges:

- The many pilot and reference projects could be leveraged even better to develop standardized products.
- Mature proprietary technologies included in the service offerings have the potential to be marketed as stand-alone products.
- The share of pilots and PoCs that have gone live into productive operations could be increased, considering the provider's size and market strength.

Trend assessment:

NEUTRAL

Advisor Statement

"Deutsche Telekom was able to prove their industrial big data analytics competence with numerous pilot and reference projects and to strengthen their position accordingly."

Category: Industrial Big Data Analytics

Device Insight

Strengths:

- The company uses leading standard components such as Microsoft tools to build up solutions for users.
- Device Insight has hands-on experience, based on concrete user projects, which is a significant advantage, compared to many other providers that have switched to Industrie 4.0 from other traditional sectors.
- Device Insight is able to improve available tools and add the required domain know-how.

Challenges:

- Considering the current lack of talent, Device Insight may soon have to master related HR challenges, for instance, by increasing investments into their internal training offerings.
- The company could transfer their good experiences, especially from the machine engineering sector, to other industries.

Trend assessment:

POSITIVE

Advisor Statement

"Device Insight combines engineering, technology and know-how to defend its leadership position."

Category: Industrial Big Data Analytics

Empolis

Strengths:

- The company provides a prototypical technology for Industrie 4.0 use cases.
- A cloud offering ensures the easy launch of solutions.
- Empolis is growing, based on organic growth and targeted acquisitions, also towards IoT and Industrie 4.0.
- The company has a solid, good history and profound knowledge of users' needs.
- Compared to last year's position as Rising Star, Empolis was able to improve their position and join the leaders of this segment.

Challenges:

- Empolis should drive technologies that actively trigger machines and facilities, based on industrial big data analyses.
- Measures to increase the awareness beyond the typical target group could help improve results even further.
- Focused sales activities could further increase industrial big data analytics revenue shares.

Trend assessment:

POSITIVE

Advisor Statement

"Empolis features many proprietary developments which are mostly done in Germany, and experiences continuous, healthy growth."

Category: Industrial Big Data Analytics

fluidOps (Rising Star)

Strengths:

- Based on semantic IT concepts, fluidOps is in a special position to conduct advanced sensor data analyses.
- Strategy and implementation are combined into a consistent overall approach.
- The solution's scalability meets current user requirements.

Challenges:

- The company must achieve continuous growth in human resources to be able to conduct more large-scale projects.
- An industry-specific training offering is important for pursuing a semantic IT approach in the digital factory.
- Measures to increase the awareness in Germany could help improve results.

Trend assessment:

POSITIVE

Advisor Statement

"fluidOps pursues a semantic IT approach, which has resulted in a very good rating among the newcomers in this segment."

Category: Industrial Big Data Analytics

HPE

Strengths:

- HPE provides a multitude of analytics solutions and respective platforms (which also have contributed to the positive rating).
- The company is familiar with the requirements of the German economy and has conducted many pre-Industrie 4.0 projects which are rightly regarded as foundation for I4.0 and IoT.

Challenges:

- HPE must provide serious answers to users' questions regarding the company's future.

Trend assessment:

NEUTRAL

Please note: After the deadline for this benchmark, the company announced that key software solutions will be sold. The rating is based on the status-quo when the research phase was completed.

Advisor Statement

"HPE provides broad know-how and a comprehensive portfolio of platforms, hardware, software and additional services to address the needs of Industrie 4.0 users."

Category: Industrial Big Data Analytics

IBM

Strengths:

- The company has a position among the best industrial analytics providers in the market, and the comprehensive offering of individual solutions, cloud platforms and products has contributed to this leadership position.
- Specific solutions out of the overall offering, for instance, elements from the Watson conglomerate, can be perceived as prototypes for future Industrie 4.0 use cases.
- Related marketing and marketing communications measures are state of the art.

Challenges:

- IBM could strengthen their top leadership position through increased pricing transparency.
- Despite the good price/performance relationship, users express criticism about the provider's pricing level.
- The provider will be able to improve their position even further through an increasing number of industrial analytics installations.
- The provider position individual products and solution even better by providing a concrete value proposition.

Trend assessment:

NEUTRAL

Advisor Statement

"IBM has a position among the best providers in the market, and the comprehensive offering of individual solutions, cloud platforms and products has contributed to this leadership position."

Category: Industrial Big Data Analytics

Microsoft

Strengths:

- Microsoft provides comprehensive technologies that are used and advanced by other companies.
- The strong partner network also contributes to the good position.

Challenges:

- Compared to the overall revenues, the revenue share of Industrie 4.0 projects is below Microsoft's potential.
- Users' feedback is not always reflecting the capabilities of Microsoft and their technologies.
- Considering the provider's size, relevance and market power, more young, industry-specific references for big data analytics use cases would be a positive signal.

Trend assessment:

POSITIVE

Advisor Statement

"Microsoft provides a broad scope of tools, including Azure IoT, PowerBI and many other solutions, which can be leveraged by users to build a solution, either on-premise or in the Microsoft cloud."

Category: Industrial Big Data Analytics

PTC

Strengths:

- PTC has focused their strategy on a 360° view of the development and production process at an early point in time.
- The company's reputation among engineers, designers and developers in the manufacturing industry is very good.

Challenges:

- PTC should drive their specific Industrie 4.0 analytics training offering.
- Within the target geography of this benchmark, PTC could increase the share of industrial big data analytics of overall revenues.
- The company has the know-how required to also provide an independent consulting offering.

Trend assessment:

POSITIVE

Advisor Statement

"PTC is closer to product development and production than any other IT provider."

Category: Industrial Big Data Analytics

SAP

Strengths:

- Data from production systems can be aggregated and visualized, based on respective functionality of the business standard software.
- SAP has continuously enhanced their portfolio; latest developments include SAP BW/4HANA; the provider's portfolio also comprises a respective cloud offering.
- The company has practical and functional use cases for Industrie 4.0 and the Internet of Things.

Challenges:

- SAP should drive technologies that actively trigger machines and facilities, based on industrial big data analyses.
- The revenue share of industrial big data analytics could be improved, compared to the provider's other business segments.
- Considering the provider's size, relevance and market power, more young, industry-specific references from Germany demonstrating the usage of visualization technologies and solutions would be of advantage.

Trend assessment:

POSITIVE

Advisor Statement

"Based on their ERP solutions and understanding of business data and processes, SAP also has an outstanding knowledge of industrial big data analytics and of how respective measures can be derived accordingly."

Category: Industrial Big Data Analytics

SAS

Strengths:

- SAS provides comprehensive BI functionality for multiple types of data, including industrial data, and enables users to develop data-driven new business processes and models.
- SAS provides a cloud for big data analytics; the solutions have a high degree of scalability.
- The provider enjoys a very good position in Germany and is familiar with the customer landscape.
- The solutions enable explorative work on data.
- The company has a solid, good history and profound knowledge of users' needs.

Challenges:

- Users express criticism about the price/performance relationship.
- The provider should enhance their specific training offering for industrial topics.

Trend assessment:

NEUTRAL

Advisor Statement

"SAS has successfully combined BI with industrial solutions and has achieved a position among the leaders."

	Industrial Big Data Analytics								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩ ⇔ ⇧
Atos	0	0	0	0	0	+	0	-	⇧
BEDM	0	0	0	0	0	0	0	0	⇧
Blue Yonder	+	0	0	0	0	-	0	0	⇔
Board	-	-	-	0	-	-	-	-	⇩
Bosch SI	+	+	+	0	0	+	0	0	⇧
Capgemini	0	0	0	0	0	0	0	-	⇔
CGI	-	-	-	0	-	-	-	-	⇔
Cisco	0	-	0	0	0	+	0	+	⇔
Cognizant	-	-	0	-	0	0	0	-	⇔
CSC	-	-	-	-	0	0	0	-	⇔
Datameer	+	-	0	0	-	-	-	-	⇔
Deutsche Telekom	+	0	0	0	0	0	+	0	⇔
Device Insight	0	+	+	0	0	0	+	0	⇧
Empolis	0	0	0	0	0	+	0	-	⇧
fluidOps	0	0	0	0	-	0	-	-	⇧
HPE	+	0	0	0	0	0	0	0	⇔
IBM	+	0	0	0	+	0	0	-	⇔
iTAC	+	0	0	0	-	0	0	0	⇧
Microsoft	+	-	0	+	0	+	0	0	⇔
MIOsoft	0	+	0	0	-	0	-	0	⇧
NorCom	0	0	-	-	0	-	0	0	⇔
PTC	+	0	0	0	+	0	+	0	⇧
Resolto	0	0	-	0	-	-	0	0	⇔
SAP	+	-	0	0	0	0	0	0	⇧
SAS	-	0	0	0	0	-	0	0	⇔
Splunk	0	0	0	0	-	-	-	-	⇔
Synop	0	-	-	0	0	0	0	-	⇔
WIPRO	0	-	-	0	0	0	-	-	⇩

Figure 15: Overview of providers of industrial big data analytics solutions with trend forecast

3.5 Industrial Security

Introduction

The fourth industrial revolution or Industrie 4.0 (I4.0) is progressing, and attackers are increasingly focusing on industrial facilities, out of avarice, economic interests or ignorance.

Connectivity between industrial facilities and business IT systems, for instance, for industrial big data analysis purposes, open many paths for such attackers. But a survey of providers on the occasion of respective trade shows has revealed that not all experts that have specialized in enterprise IT security have got ready to include these new challenges. Future editions of this vendor benchmark will show how the market is developing.

Realistically we should doubt some of the horror scenarios of industrial espionage (based on sayings such as “those who have not fallen victim yet to digital attacks, simply don’t know about them”). Nevertheless, real threats are existing, and the demand for means to prevent, thwart off, detect and trace attacks on industrial IT systems is growing accordingly. Concerning the security of the “Internet of Things”, hardly any answers have been provided yet. Not only professional users, but also people that are not very IT- and security-affine are challenged to change their perception.

Major risks for industrial control systems are not related to information losses, but rather include system failures, communication losses and the loss of control. Often, such disruptive scenarios are a result of malware such as ransomware and DDoS attacks. Endpoint security and network security solutions can be used to prevent such attacks.

Key criteria for providers of industrial security solutions include the suitability for and access of traditional IT security tools to production facilities and factories and the question whether and to what extent the solutions go beyond measures such as antivirus and antimalware products for business IT systems and PC workplaces. Additional criteria included the following:

- Strategy, vision and technology leadership
- Product features, depth of portfolio and roadmap
- USP, skills, architecture and solution design
- Service, support and additional solutions
- Client experience (portfolio quality from the customers' perspective) with customer satisfaction ratings and feedback
- Market position and market presence
- Revenues and growth rates
- References and customer projects
- Image and degree of awareness
- Innovation
- Stability, financial and organizational dependencies of the German organization
- Advertising, PR, marketing communications, sales marketing and sales
- Channel and partnerships

The industrial security category was included into the benchmark for the first time.

Evaluation of Providers

Experton Group has identified 10 relevant **industrial security providers** for the German market. Five out of these providers were positioned in the leader quadrant:

- Cisco
- GE (General Electric)
- IBM
- Intel/McAfee
- Siemens

HEAT Software has been positioned as the Rising Star of this segment.

Figure 16: Quadrant for industrial security

Category: Industrial Security

Cisco

Strengths:

- Cisco's hardware portfolio and related products and solutions include comprehensive ICT offerings for protecting Industrie 4.0 use cases.
- The company has a very good organization in Germany.
- Cisco and their partners have a very good training and consulting offering.

Challenges:

- Some users are skeptical about the price-performance relationship.
- Individual users express concerns about a potential vendor lock-in.

Trend assessment:

POSITIVE

Advisor Statement

"Cisco's portfolio also includes security solutions that are suitable for rough conditions and can protect Industrie 4.0 landscapes at points where data are collected."

Category: Industrial Security

GE

Strengths:

- The company enjoys a very good reputation and has enhanced their scope of offerings significantly during the last few years.
- When it comes to the protection of Industrie 4.0 use cases, GE can leverage their experiences with protecting industrial facilities and can transform these experiences into new variants.
- The company provides a prototypical technology for Industrie 4.0 use cases.

Challenges:

- The strategy in Germany could be communicated more strongly into the market and go beyond the provider's own systems and products.
- To support this goal, GE could emphasize their ICT competences.
- A product- and project-independent service and consulting offering would increase the company's attractiveness even further.

Trend assessment:

POSITIVE

Advisor Statement

"Hardly any other provider is as close to industrial facilities as General Electric; for many years, the protection of these systems has been an important aspect for the definition of GE products and solutions."

Category: Industrial Security

HEAT Software (Rising Star)

Strengths:

- The provider is engaged in many marketing and promotional activities.
- The solutions also address the end point in the digital factory.
- Within the period under review, HEAT Software has noticeably strengthened their commitment.

Challenges:

- The provider should drive technologies that also address the protection needs of the individual machine.
- HEAT Software should drive their specific Industrie 4.0 analytics training offering.
- The service and consulting offering should be enhanced beyond project-related services.

Trend assessment:

POSITIVE

Advisor Statement

"HEAT Software has demonstrated continuous development and can look ahead with confidence."

Category: Industrial Security

IBM

Strengths:

- Users can choose among 97 IBM security products, including data protection and privacy solutions, for instance, for the cloud, to create a solution that can also be used to protect Industrie 4.0 use cases.
- IBM provides a comprehensive and mature service portfolio.
- As compared to some competitors, IBM joins the group of leaders with a future perspective and a secure situation concerning the company's future viability.

Challenges:

- Concepts such as IBM Watson and IBM Watson IoT must be substantiated with a concrete value proposition and an industry-specific solution approach.
- The clear differences between IoT and Industrie 4.0 must also be communicated to users within the context of the provider's security products and solutions.
- Users are challenged to deal with the broad range of offerings, the scope of the product and solution portfolio and must determine where to place Watson within complex processes.
- Many users perceive the price level as too high, also because support by the provider's service organization is required.

Trend assessment:

NEUTRAL

Advisor Statement

"IBM provides an enormous scope of software products, IoT concepts and services, and users must deal with this huge offering when they are taking measures to protect their Industrie 4.0 use cases."

Category: Industrial Security

Intel Security

Strengths:

- The company provides a comprehensive service and consulting package to address users' industrial analytics needs.
- The provider's solutions are perceived as a tested and proven offering and are frequently used by user organizations.
- The company provides a prototypical technology for Industrie 4.0 use cases.
- The company has a solid, good history and profound knowledge of users' needs.

Challenges:

- The revenue share of industrial big data analytics could be improved, compared to the provider's other business segments.
- Intel should drive their specific Industrie 4.0 analytics training offering.

Trend assessment:

NEUTRAL

Please note: After this analysis was completed, Intel announced a spin-off of their security solutions business and plans to sell the McAfee acquisition. Currently, we cannot foresee the full impact of this measure. Within this benchmark, our ratings are based on the provider's situation at the deadline for this study.

Advisor Statement

"Intel Security protects IoT applications, for instance, based on technologies to ward off ransomware that is targeted at machines and production-related network components."

Category: Industrial Security

Siemens

Strengths:

- Siemens provides comprehensive protection of industrial facilities, based on an IP address.
- Additional services such as an emergency team and a maintenance team support users to ensure the secure operations of Industrie 4.0 applications.
- Siemens has a good reputation and is perceived as a pioneer in many ways.

Challenges:

- Users are still skeptical about the price-performance relationship.
- Considering the company size and market power, more public references outside the provider's traditional target group would be of advantage.

Trend assessment:

POSITIVE

Advisor Statement

"In the wake of dramatic attacks on systems, Siemens was motivated to develop a very comprehensive portfolio to ensure the security of Industrie 4.0 use case."

	Industrial Security								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩ ⇔ ⇧
Barracuda	0	0	-	-	-	-	0	0	⇧
Cisco	0	+	0	-	0	-	0	0	⇧
CyberArk	0	0	0	0	-	-	-	-	⇧
Fortinet	-	-	-	-	-	-	-	-	⇩
GE	0	0	0	-	0	0	0	0	⇧
HEAT Software	0	-	0	0	-	-	0	0	⇧
IBM	0	0	-	-	0	0	0	+	⇔
Intel/McAfee	0	0	-	0	0	-	0	0	⇔
Symantec	0	0	-	0	0	0	0	0	⇩
Siemens	+	0	0	-	0	0	+	+	⇧

Figure 17: Overview of providers of industrial security solutions with trend forecast

3.6 Industrial Dashboards & Visualization

Introduction

While in the wake of digitization, machine traffic lights are not sufficient anymore to transmit condition information to the plant manager, they are often the means of communications for workers on the machine. During the last 40 years, analogous control systems have been increasingly digitized. MES (manufacturing execution systems) have been used to condense and aggregate information in a way that allowed companies to link them to business IT systems.

BI/BA technologies have evolved in parallel to MES. In today's solutions for machine data visualization, these two approaches are combined to provide easy-to-understand visualizations of machine conditions or stock levels, even of complex data and even across whole production facilities. An even more in-depth analysis of data results in solutions such as those that have been analyzed within the "industrial big data analytics" segment of this benchmark.

Industrial visualization refers to solutions that can be used to graphically prepare and visualize machine data from multiple sources to help users gain new insights. As of today, monitoring dashboards for remote monitoring (and maintenance) are the most important IoT&I4.0 use case.

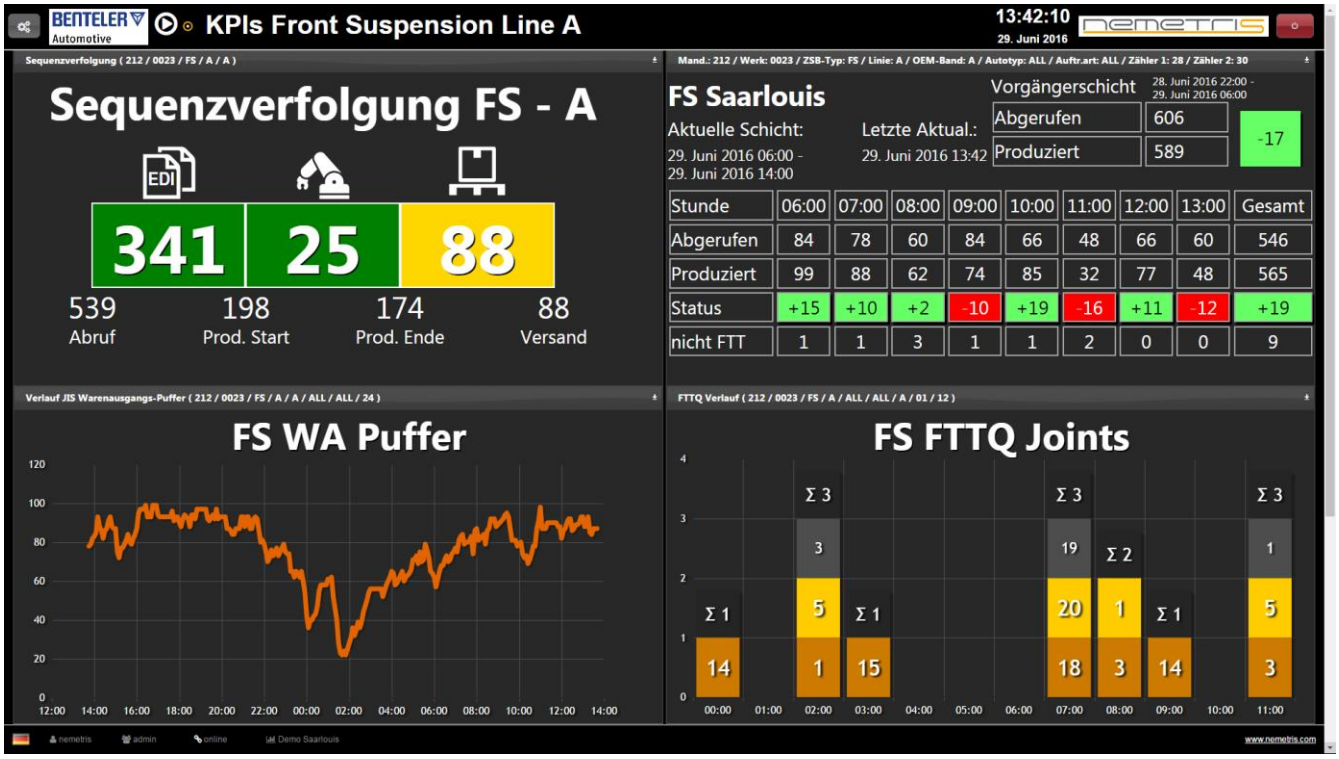
From a technical perspective, the market is somewhat volatile, since obviously, this is not a matter of "control systems" to be equipped with state-of-the-art visualization capabilities for data from a traditional WWS, ERP system, PPS, CRM or SCM system. Rather, the challenge is to consolidate the data from these systems and derive new insights, for instance, by visualizing correlations between multiple business processes of a manufacturing company.

Example: Sequence production monitoring at Benteler

Supported by the nemetris Web Dashboard, Benteler is able to monitor key data from the time-critical JIS (just-in-sequence) production from multiple data sources.

The system is based on live data and displays products to be manufactured, from demand to production and shipping, including puffer for outgoing goods (abbr. WA), quality/production data and progress information on status with surplus/deficit.

JIS production refers to batch-1 serial production with short cycles and a high number of variants of products demanded by the OEM.



Source: nemetris, 2016

Figure 18: Sequence production monitoring at Benteler Automotive

Key evaluation criteria and requirements for provider of industrial dashboards and visualization solutions include options to collect sensor and other machine data and convert them into information, based on a graphical representation, to generate visualizations, similar to control stations, and display historical situations and data from multiple processes. The flexibility of the analyzed solutions to cover multiple kind of data and visualization formats played a key role. Business criteria were also included in the evaluation.

nemetris is the Rising Star of this segment; the provider's dashboard tool is being used by several independent vendors of Industrie 4.0 solutions. nemetris is a newcomer to this category of solutions. The company is highly innovative and promising. Both Device Insight and IBM were able to improve their position within the leader quadrant. Newcomers in this segment include Cumulocity and Qlik. For some categories, narrower definitions were specified for this year's benchmark; as a result, some providers are not included in this category anymore. Some evaluation criteria such as independence, the completeness of the respective solution etc. received a stronger or lower weighting, which has resulted in very slight changes of some vendors' position.

All of these companies are software vendors. Products that display a status directly in the machine were not examined. Control stations, MES and companies with no distinct footprint in Germany were also excluded from our analysis.

Evaluation of Providers

Experton Group has identified 12 relevant providers of **industrial dashboards and visualization solutions** for the German market. The following five out of these providers reached a position as leader:

- Device Insight
- IBM
- Microsoft
- OpenText
- SAP

nemetris has been identified as the "Rising Star" of this segment.

Figure 19: Quadrant for industrial dashboards/visualization

Category: Industrial Big Data Dashboards/Visualization

Device Insight

Strengths:

- The provider has a good understanding of user needs.
- The solution is based on proven and tested standard technologies such as PowerBI.
- Device Insight pursues an industry-specific approach.

Challenges:

- The company could bundle the existing know-how within a competence center, which would support respective targeted customer communications.
- Measures to increase the awareness in Germany could help improve results.

Trend assessment:

NEUTRAL

Advisor Statement

"Device Insight enhances technologies such as PowerBI with domain know-how around machines and systems, ensuring practical and easy-to-understand dashboard visualizations."

Category: Industrial Big Data Dashboards/Visualization

IBM

Strengths:

- IBM is an international and national leader in the ICT market and has addressed Industrie 4.0 at an early point in time.
- IBM enjoys financial stability.
- Meanwhile international training offerings are available in Germany, and as a result, ratings for such supporting aspects have improved accordingly.

Challenges:

- Customers criticize a lack of pricing transparency, because often actual prices for a solution only are revealed during the respective project.

Trend assessment:

POSITIVE

Advisor Statement

"IBM has an extremely broad scope of solutions, including products from the Watson product family, which can be leveraged by users to develop all kinds of dashboards and visualizations."

Category: Industrial Big Data Dashboards/Visualization

Microsoft

Strengths:

- Microsoft demonstrates exemplary approaches when it comes to bug fixing, partner certifications and cloud offering.
- The visualization solutions are part of the de-facto industry standard for diagrams and similar visualizations.
- The provider's solutions are implemented into practical solutions by a large number of qualified partners.

Challenges:

- Considering the provider's technological capabilities, the potential for Industrie 4.0-specific out-of-the-box solutions could be enhanced further.
- A stronger focus should be laid on Industrie 4.0 specifics in Germany that go beyond IoT.
- The provider could complete their offering with a dedicated consulting and development team for Germany as a target geography.

Trend assessment:

POSITIVE

Advisor Statement

"Visualization solutions by Microsoft have become part of the de-facto industry standard."

Category: Industrial Big Data Dashboards/Visualization

nemetris (Rising Star)

Strengths:

- The company is independent of international corporate structures or demands by venture capitalists.
- The technology is flexibly and can be extended easily and modified to address users' specific requirements.
- The overall offering also includes cloud and hosting services.

Challenges:

- The company could increase its size and relevance through organic growth to gain additional market shares in the German market.
- Measures to increase the awareness in Germany could help improve results.
- Trade shows and customer satisfaction results published by independent institutions could be key for winning new customers.
- As of to date, cloud and hosting services are only available through partners.

Trend assessment:

POSITIVE

Advisor Statement

"nemetris has a flexible technology, great economic and technical independence and provides additional services, which have contributed to position the provider as the Rising Star of this segment."

Category: Industrial Big Data Dashboards/Visualization

OpenText

Strengths:

- The company has an established partner landscape and a solid history in the German market.
- Enterprise information management by OpenText has proven its suitability also for machines and systems.
- Customer are enabled to set up attractive and informative visualizations.

Challenges:

- A direct and industry-specific market approach with respective branding would help to even better communicate the provider's commitment.
- The provider is challenged to provide more positive impulses to further increase the industry-specific market shares.
- OpenText should drive their specific Industrie 4.0 analytics training offering.

Trend assessment:

NEUTRAL

Advisor Statement

"Enterprise information management by OpenText has proven its suitability for machines and systems."

Category: Industrial Big Data Dashboards/Visualization

SAP

Strengths:

- SAP's experience with business data visualization is useful to help visualize data from production systems.
- SAP has enhanced their offering continuously, including the recent Roambi acquisition.
- SAP is able to deliver complex representations and visualizations in the sense of "war rooms" or "control station" walls.

Challenges:

- Users have a critical attitude towards the cloud offerings that support the solutions.
- Considering the size, relevance and market power of the provider, more young, industry-specific references from Germany demonstrating the usage of visualization technologies and solutions would be of advantage.

Trend assessment:

POSITIVE

Advisor Statement

"Within this category, SAP distinguishes themselves through a broad and complete offering." "

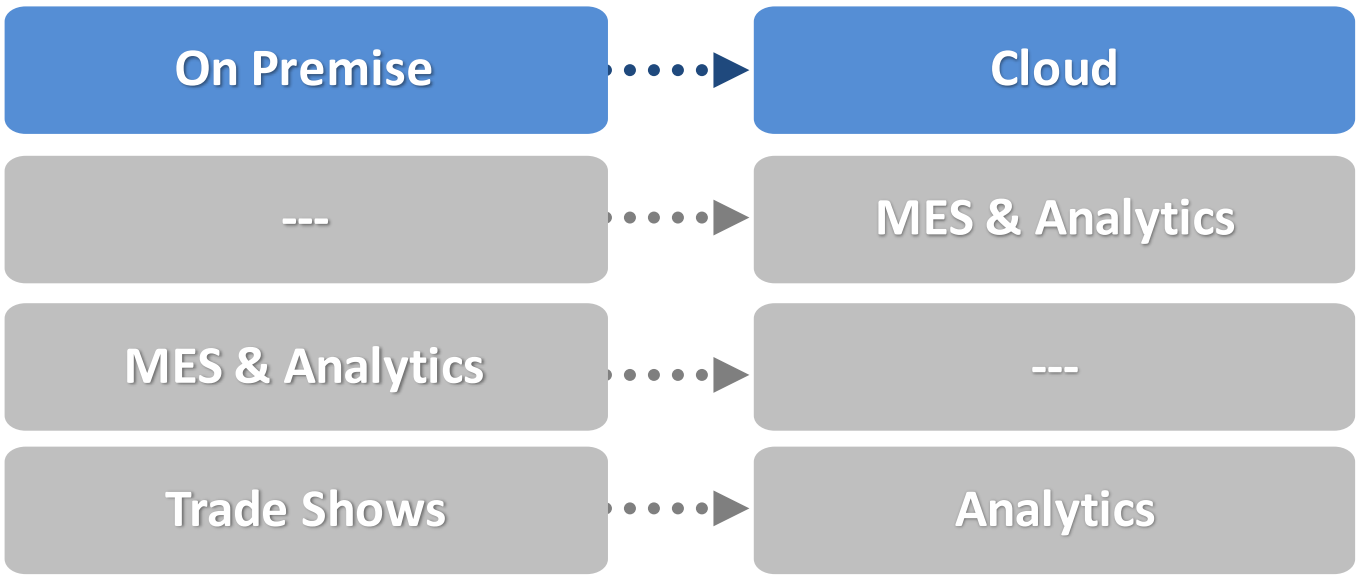
	Industrial Big Data Dashboards/ Visualization								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩ ⇔ ⇧
Cumulocity	0	0	0	0	0	-	-	-	⇔
Data Watch	0	0	0	0	-	-	-	-	⇔
Datameer	0	-	+	0	0	0	-	0	⇔
Device Insight	0	0	0	0	0	+	0	0	⇔
IBM	0	0	0	0	0	0	0	0	⇧
Microsoft	+	-	0	0	0	0	0	+	⇧
nemetris	0	-	0	0	0	-	0	0	⇧
OpenText	0	0	0	0	0	0	-	0	⇩
Qlik	+	-	-	0	0	-	0	0	⇩
SAP	+	0	0	0	0	0	-	0	⇧
Splunk	+	0	0	0	-	-	0	0	⇔
Tableau	+	0	+	0	-	0	-	-	⇧

Figure 20: Overview of providers of industrial big data dashboards/visualization solutions with trend forecast

3.7 Industrie 4.0 Platforms

Introduction

The traditional core task of MES solutions (manufacturing execution systems) is to control the production process in real time, and solutions are advancing around this core aspect. Increasingly, new technical concepts such as cloud, analytics, big data and microservices are integrated. A new generation of smart solutions for connecting and automating the production process is emerging, which Experton Group has named Industrie 4.0 platforms. Currently, I4.0 platforms are provisioned, based on three delivery models: completely cloud-based, completely on-premise or within a hybrid model (in this case, the MES is normally provisioned on-premise and analytics out of the cloud).



Source: Experton Group, 2016

Figure 21: Delivery models for Industrie 4.0 platforms

Key evaluation criteria and requirements for Industrie 4.0 platform providers can be summarized as follows:

- Strategy and vision
- Scalability (cloud-based)
- Analytics/big-date capabilities
- Breadth & depth of functionality
- References
- Microservices approach

Industrie 4.0 platforms have been included for the first time into Experton Group's I4.0/IoT Vendor Benchmark. While IoT platforms have been established for quite some time in the market, new platforms for production environments are now also becoming available. As opposed to IoT platforms, where the focus is on decentralized/distributed devices that are being equipped with and managed via sensors (via the cloud and not necessarily in real time), I4.0 platforms have a focus on controlling locally stationed devices ("at the edge" and in real time). As a result, use cases are also different. Current IoT platforms are often used for remote monitoring, remote maintenance and predictive maintenance purposes; I4.0 platforms, on the other hand, have a focus on the overall production process. While the I4.0 platform market segment is not fully established, the core that has initiated this development has already emerged. The good old manufacturing execution systems (MES) are often the center of development, and the tendency goes toward a great vision – the flexible, self-optimizing production, which must master the data flood in real time, while also ensuring an increasing degree of flexibility. Setting up analytics/big data capabilities and microservice structures are key challenges on this way. Innovative MES providers are driving this development and equip their established solutions with these new technical capabilities. This year's quadrant provides a first overview of the provider landscape in this market segment. For Experton Group, current market leaders include Bosch SI, iTAC, Beckhoff, FORCAM and FIT. AXOOM has received the Rising Star award, due to the provider's unique microservices approach.

Evaluation of Providers

Experton Group has identified 10 providers of Industrie 4.0 platforms in the German market. Five out of these providers were positioned in the leader quadrant:

- Beckhoff
- Bosch SI
- FORCAM
- Freudenberg IT
- iTAC

AXOOM has been positioned as the Rising Star of this segment.

Figure 22: Quadrant for Industrie 4.0 platforms

Category: I4.0 Platforms

AXOOM (Rising Star)

Strengths:

- AXOOM pursues a unique vision: The AXOOM platform has been designed to constitute a microservices-based system (including ERP, MES; calculation services etc.), with dedicated suitability for customized mass production.
- Within the next expansion level, the platform shall provide many individual tools (apps by multiple providers) along the horizontal value chain: order entry (e-commerce connectivity, fast and easy quotations) – order management – procurement – production (MES, planning, performance management) – logistics – reporting.
- Since August 2016, the first seven apps have been available through the provider's own app store. Initial partners of the Trumpf subsidiary are Klöckner, Linde, Schmalz, SICK, TRUMPF, Wicam and XETICS.

Challenges:

- While the foundation has been laid, some functionality is still missing. The next roll-out step is expected for the second half year 2016.
- More in-depth analytics capabilities (big data and machine learning) are not included in the platform yet.
- The provider must further increase the degree of awareness and leverage the momentum to win additional partners quickly and enhance the customer base.

Trend assessment:

POSITIVE

Advisor Statement

"AXOOM has been designed to evolve into a microservices-based system for customized mass production."

Category: I4.0 Platforms

Beckhoff

Strengths:

- TwinCAT Analytics analyzes production data and also includes machine learning functionality for predictive maintenance purposes.
- TwinCAT IoT enables the Beckhoff controllers to communicate with cloud services. Supported communications protocols include AMQP (Microsoft) and MQTT (AWS). OPC-UA is also available.
- TwinCAT IoT & Analytics can be provisioned via AWS, Azure or the Beckhoff Cloud (there are plans to also provision the solution via SAP HANA), and so, analytics functionality such as big data and machine learning are also available.
- Beckhoff enjoys a high reputation in the I4.0 segment and is perceived as a pioneer.

Challenges:

- TwinCAT IoT & Analytics have only been available since summer 2016.
- No reference customers for TwinCAT IoT & Analytics are available yet.

Trend assessment:

POSITIVE

Advisor Statement

"Beckhoff enjoys a high reputation in the I4.0 segment and is perceived as a pioneer."

Category: I4.0 Platforms

Bosch SI

Strengths:

- The Production Performance Manager is evolving into a comprehensive I4.0 platform (on-premise), including connectivity to the proprietary IoT platform (cloud-based Bosch IoT Suite).
- No other player enjoys such a strong position in the IoT and I4.0 platform segments, which enables Bosch SI to build a bridge to hybrid use cases (I4.0/IoT).
- The Production Performance Manager (PPM) distributes tasks, based on a ticket system, to service and maintenance staff. PPM includes integration with the Production Quality Manager (PQM) for process visualization to perform fault detection in real time.
- PPM is equipped with advanced analytics capabilities (big data and machine learning), based on direct connectivity to the Bosch IoT Suite. PA-ATMO can also be used to directly integrate Bosch' proprietary MES solution.

Challenges:

- The on-premise analytics solution (manufacturing analytics solutions) has not been integrated with PPM (yet).
- The PPM customer base is still relatively small, since the product has been launched only recently.
- Bosch' focus on the proprietary MES (PA-ATMO) is limited.

Trend assessment:

POSITIVE

Advisor Statement

"The Production Performance Manager by Bosch SI is evolving into a comprehensive I4.0 platform."

Category: I4.0 Platforms

FIT

Strengths:

- FIT's strengths are perfect to address Industrie 4.0 topics. Experiences with the industry sector, MES, cloud and SAP system integration (ERP & HANA-based analyses) perfectly complement each other.
- FIT provides a comprehensive and completely integrated Industrie 4.0 portfolio (all based on SAP), including MES, cloud, analytics, starter packs, gateways and consulting & system integration.
- FIT IoT Analysis is based on SAP HANA technology. Customers can also choose Microsoft Azure, which also includes machine learning functionality.

Challenges:

- The FIT IoT Platform and FIT IoT Analysis currently have no awareness in the German market.
- The customer base is still small (the offering is still new), but 4 IoT scans (PoCs) in renowned German companies have already been conducted.
- FIT's strengths are very well suited to address Industrie 4.0 topics, and the provider should strengthen their focus accordingly.

Trend assessment:

POSITIVE

Advisor Statement

"FIT's strengths are very well suited to address Industrie 4.0 topics – a stronger focus would be of advantage."

Category: I4.0 Platforms

FORCAM

Strengths:

- FORCAM is an innovator for cloud-based MES with big data analytics in real time (in cooperation with partner Microsoft). FORCAM Force has been available since April 2015.
- FORCAM has renowned local reference customers, including Audi, Daimler, Mann & Hummel and Schaeffler.
- The starter kit for FORCAM Force is available at a fixed price.

Challenges:

- Machine learning (predictive analytics) is not available yet.

Trend assessment:

POSITIVE

Advisor Statement

"FORCAM is an innovator for cloud-based MES with big data analytics in real time."

Category: I4.0 Platforms

iTAC

Strengths:

- iTAC is a cloud MES pioneer (since 2011), provides a comprehensive, dedicated cloud-based MES solution from the public cloud for the midmarket segment and can name respective reference customers (e.g., MID-Tronic).
- The iTAC.IoT.Suite is available on the Microsoft Azure as well as the AWS platform, and therefore, users are also provided the big data analytics and machine learning functionality of these platforms.
- iTAC is a technology leader and has proven that cloud-based production control in near real time is possible. Also, the new IoT services are available as Docker containers and connectivity via OPC-UA is also possible.
- In cooperation with Fraunhofer Institute, iTAC develops a “machine-learning-as-a-service” (MLaaS)” solution around the iTAC.IoT.Suite (market-ready in 2018).

Challenges:

- The provider’s proprietary analytics tool (iTAC.BigData.Analytics) is only available as on-premise and not as cloud-based solution.
- The machine-learning-as-a-service (MLaaS) solution is expected to be launched not before 2018.
- iTAC is a relatively small company with 104 employees and revenues of 15 million Euros and was acquired by Dürr AG in 2015.

Trend assessment:

POSITIVE

Advisor Statement

“iTAC is a technology leader and has proven that cloud-based production control in near real time is possible.”

	Industrie 4.0 Platforms								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩⇔⇧
AXOOM	+	0	0	0	-	0	-	-	⇧
Beckhoff	+	+	+	+	0	0	0	0	⇧
Bosch SI	+	+	+	0	+	+	0	-	⇧
FIT	0	0	0	0	0	0	0	-	⇧
FORCAM	0	0	0	0	0	0	0	0	⇧
Gefasoft	-	-	-	-	0	0	0	0	⇔
iTAC	+	+	+	+	0	0	0	0	⇧
MPDV	-	-	-	-	-	-	-	-	⇔
Plex	0	0	0	0	-	-	-	-	⇔
Siemens	0	0	0	0	0	0	0	0	⇧

Figure 23: Overview of providers of Industrie 4.0 platforms with trend forecast

3.8 Consulting & Integration – IoT Logistics

Introduction

While initial Industrie 4.0 developments for the logistics segment were mostly track & trace solutions to better track the transport process of goods, based on a chip, the offering is being enhanced to cover a broader variety of use cases. IoT logistics still has a focus on product tracking and transport path optimization as well as fleet management for forwarding agents. Smart fleet management solutions go beyond GPS tracking of vehicles and analyze consumption data, maintenance needs caused by wear and tear and fuel optimization.

While real Industrie 4.0 use cases for automated responses, based on the collected data, are still the exception, we will soon see cases where, for instance, big data and the increasingly available data streams and data analyses are used to integrate automatic maintenance stops into the route to minimize downtimes. Within the next few years, we expect many exciting projects for consulting houses and integration services providers.

Within this benchmark, Experton Group analyzes solutions as well as consulting and integration services with a clear focus on digitization, automation and connectedness within the external logistics chain.

The following use cases are examined:

1. Intelligent fleet management solutions
2. Track & trace solutions and their degree of automation

Leaders distinguish themselves through their industry-specific competence and are perceived as thought leaders.

Key evaluation criteria and requirements for providers of consulting and integration services for transportation & logistics use cases can be summarized as follows:

- Strategy and vision
- Thought leadership (events, white papers, etc.)
- Strategic I4.0 & IoT focus
- Breadth of portfolio: scope of consulting & integration services
- Portfolio quality: customer satisfaction, industry-specific & process know-how, USP
- Innovation potential
- Business value
- Local specifics: product support, infrastructure, references
- Awareness & image
- Core competence
- Go-to-market strategy
- Technology partner landscapes

Besides traditional integrators such as IBM, Capgemini, Atos and Deutsche Telekom smaller and specialized providers such as Device Insight were also able to improve their ratings and achieve a leadership position. Industry specialist Inconso, the Rising Star of last year's benchmark, was not able to further improve their position in the consulting & integration segment.

This year's Rising Star is UNITY. UNITY has good German show cases for fully-automated and self-optimizing warehouse systems; such references are still scarce, even among leading IT service providers.

Evaluation of Providers

Experton Group has identified 21 relevant providers of **consulting & integration services - IoT logistics** for the German market. The following 10 of these providers have been positioned as leaders:

- Accenture
- Atos
- BEDM
- Bosch SI
- Capgemini
- CGI
- Deutsche Telekom
- Device Insight
- FuM
- IBM

UNITY has been identified as Rising Star.

Figure 24: Quadrant for consulting & integration – IoT logistics

Category: Consulting & Integration – IoT Logistics

Accenture

Strengths:

- Accenture is positioned as independent consulting house with leading-edge integration know-how and their own industry-specific solutions for the logistics and transportation segment.
- Accenture's Open Cargo solution provides a broad portfolio for tracking & tracing, dynamic routing of goods transportation and analytics.

Challenges:

- The American provider does not have show cases in the German market.
- As of to date, available solutions do not support end-to-end, fully automated Industrie 4.0 use cases.

Trend assessment:

NEUTRAL

Advisor Statement

"Accenture combines integration expertise in the logistics industry with a broad portfolio of goods transportation solutions."

Category: Consulting & Integration – IoT Logistics

Atos

Strengths:

- Atos' warehouse automation solution ICAM provides a broad industry-specific portfolio.
- The French provider has much experience with the logistics sector and has very good European references.
- With Michelin, Atos presents an interesting show case for analyzing tire dates and the driving behavior of truck drivers to reduce fuel consumption.

Challenges:

- Atos could further increase their degree of awareness in the German market for logistics solutions.
- As of to date, available solutions do not support end-to-end, fully automated Industrie 4.0 use cases.

Trend assessment:

NEUTRAL

Advisor Statement

"Atos provides a broad industry-specific portfolio, has much experience with the logistics segment and has very good references in Germany."

Category: Consulting & Integration – IoT Logistics

BEDM

Strengths:

- The medium-sized system house's RailCM is a differentiated solution for predictive maintenance on the wheels of transport wagons.
- As one of few providers BEDM is able to fully automate responses on unusual conditions on affected sensors, based on a feedback channel.
- The pricing model for the Industrie 4.0 logistics portfolio is flexible, based on the usage of delivered information.

Challenges:

- BEDM does not have current references for the solution.
- The provider faces strong competition with leading IT service providers that enjoy a higher degree of awareness.

Trend assessment:

POSITIVE

Advisor Statement

"BEDM is among the few providers in the German market that offer a real Industrie 4.0 solution with automated responses."

Category: Consulting & Integration – IoT Logistics

Bosch SI

Strengths:

- Bosch SI provides a broad portfolio of solutions, including fleet management, container monitoring and asset management for railway applications.
- Based on their history in the production segment, the provider has a lot of experience with optimizing production-related logistics processes.

Challenges:

- As of to date, Bosch SI has only few references and show cases in the German transportation industry.
- The degree of awareness of the logistics portfolio could be improved.

Trend assessment:

POSITIVE

Advisor Statement

"Bosch SI provides a broad portfolio of solutions, including fleet management, container monitoring and asset management for railway applications."

Category: Consulting & Integration – IoT Logistics

Capgemini

Strengths:

- Capgemini has specialized consulting competence and a broad portfolio for IoT logistics solutions, from digital warehouse management to transport management systems.
- The French provider is also highly competent when it comes to integrating IoT solutions with existing transport systems.

Challenges:

- As of to date, Capgemini has no references and show cases in the German transportation industry.
- As of to date, available solutions do not support end-to-end, fully automated Industrie 4.0 use cases.

Trend assessment:

NEUTRAL

Advisor Statement

"Capgemini has specialized consulting competence and a broad portfolio for IoT logistics solutions, from digital warehouse management to transport management systems."

Category: Consulting & Integration – IoT Logistics

CGI

Strengths:

- CGI has many years of integration and consulting experience with solutions for transportation and logistics companies.
- The provider has a broad portfolio and strong German references.
- Based on numerous projects and the good position, also in the German market for logistics solutions, CGI enjoys a very high degree of awareness of their consulting and system integration offering.

Challenges:

- As of to date, available solutions do not support end-to-end, fully automated Industrie 4.0 use cases.
- The company is facing strong competition with leading IT service providers.

Trend assessment:

NEUTRAL

Advisor Statement

"Based on numerous projects and the good position, also in the German market for logistics solutions, CGI enjoys a very high degree of awareness of their consulting and system integration offering."

Category: Consulting & Integration – IoT Logistics

Deutsche Telekom

Strengths:

- Deutsche Telekom has a very complex portfolio, from connectivity solutions to fleet management, container management, track & trace solutions and even a complete solution for the automated shipping of suitcases for end customers.
- The German provider has very good references, which are prepared accordingly to be marketed as show cases.
- Deutsche Telekom addresses customers, from the midmarket segment to international corporations, and enjoys a very high degree of awareness.

Challenges:

- While available solutions provide advanced digitization and analytics functionality, they do not support fully automated Industrie 4.0 use cases.

Trend assessment:

NEUTRAL

Advisor Statement

"Deutsche Telekom has a very complex portfolio, from connectivity solutions to fleet management, container management, track & trace solutions and even a complete solution for the automated shipping of suitcases for end customers."

Category: Consulting & Integration – IoT Logistics

Device Insight

Strengths:

- Device Insight is an interesting provider from the sensor technology/tracking & tracing segment and has achieved a good momentum during the last 12 months.
- Device Insight has a broad portfolio, combining geocoding with asset tracking and fleet management for forwarding agents.
- Device Insight has engaged in a sales partnership with Vodafone and has strong references and show cases in the German market.

Challenges:

- Additional partnerships with innovative IT service providers could increase the provider's momentum even further.

Trend assessment:

NEUTRAL

Advisor Statement

"Device Insight is an interesting provider from the sensor technology segment who is dynamically strengthening their position with tracking & tracing and innovative fleet management solutions."

Category: Consulting & Integration – IoT Logistics

FuM

Strengths:

- FuM has much experience with production-related logistics processes and enjoys a strong market presence in Germany.
- The German provider has an interesting solution that allows for the centralized control of global logistics processes for bulk goods.

Challenges:

- Except for the solution described above, the degree of awareness of IoT logistics solutions can be improved further.
- While available solutions provide advanced digitization and analytics functionality, they do not support fully automated Industrie 4.0 use cases-

Trend assessment:

NEUTRAL

Advisor Statement

"FuM enjoys a strong market presence in Germany; the interesting offering includes a solution that allows for the centralized control of global logistics processes for bulk goods."

Category: Consulting & Integration – IoT Logistics

IBM

Strengths:

- IBM is among the leading global providers of optimization and automation solutions for logistics and the supply chain. The global integration house can leverage their national and international best practices and consultants.
- IBM enjoys a very high degree of awareness in this segment and has good references in the German market.

Challenges:

- While available solutions provide advanced digitization and analytics functionality, they do not support fully automated Industrie 4.0 use cases-

Trend assessment:

NEUTRAL

Advisor Statement

"IBM is among the leading global providers of optimization and automation solutions for logistics and the supply chain."

Category: Consulting & Integration – IoT Logistics

UNITY (Rising Star)

Strengths:

- UNITY has a broad portfolio for logistics process optimization, including connected fleet management and process automation for logistics planning processes.
- UNITY has good German show cases for fully automated and self-optimizing warehouse systems, which are still scarce, even among leading IT service providers.

Challenges:

- The innovative provider could increase the degree of awareness of their real Industrie 4.0 solutions significantly.

Trend assessment:

POSITIVE

Advisor Statement

"UNITY has good German show cases for fully automated and self-optimizing warehouse systems, which is a real USP in today's market."

	Consulting and Integration / IoT Logistics								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩ ⇔ ⇧
Accenture	0	0	0	0	0	0	0	0	⇔
Atos	+	0	0	0	0	0	0	0	⇔
BEDM	0	0	+	0	0	0	0	0	⇧
Bosch SI	0	0	0	0	0	0	0	0	⇧
Capgemini	0	0	0	0	0	0	0	0	⇔
CGI	0	0	0	0	+	+	+	+	⇔
Cognizant	0	0	-	-	0	0	0	0	⇔
Deutsche Telekom	+	0	0	0	0	+	+	+	⇔
Device Insight	0	0	0	0	0	0	0	0	⇧
FuM	0	0	0	0	0	0	0	0	⇔
HCL	-	0	-	-	-	0	-	-	⇔
IBM	0	0	0	0	0	+	0	0	⇔
Inconso	0	-	0	0	0	0	0	0	⇩
Infosys	0	0	0	0	-	-	-	-	⇧
NTT Data	0	0	0	0	-	0	-	-	⇔
Sopra Steria	-	0	0	0	0	0	0	0	⇔
TCS	0	0	0	0	-	-	0	0	⇔
Tech Mahindra	+	0	0	0	-	0	-	0	⇧
UNITY	+	0	0	0	0	0	0	0	⇧
Vodafone	0	0	-	0	-	-	-	-	⇔
Wipro	0	0	0	0	0	0	0	0	⇔

Figure 25: Overview of providers of consulting & integration services – IoT logistics with trend forecast

3.9 Consulting & Integration – Connected Cars

Introduction

Hardly any other IT topic is gaining as much media attention as automated driving. Even after the fatal accident of a passenger of a self-driving vehicle in the US, debates about social questions such as “who is liable when there is no driver?” are still in a very early stage

We have analyzed solutions as well as consulting and integration services with a clear focus on digitization, automation and connectedness of vehicles. The following use cases have been examined:

1. Smart, connected support systems for drivers, based on sensor data
2. Smart systems for car-to-car communications to increase the overall security

Key evaluation criteria and requirements for providers of consulting and integration services for connected-car use cases can be summarized as follows:

- Breadth & depth of portfolio
- C&SI for connected-car solutions (connectedness between cars for additional services)
- Delivery quality (local criterion)
- Customer satisfaction with the delivery quality, based on local references and customer surveys
- Delivery performance, based on team strength (size, skills, experience, USP)
- Strategic focus on important industry-specific future topics (e.g., self-driving vehicles)
- Go-to-market: access to customers within the automotive sector via direct sales, channel, marketing
- Core competences: innovation, security, analytics, customer focus, partnerships
- Market position: revenues & growth rates within this market segment in Germany
- Awareness among and rating by customers

In the connected cars segment we have observed significant technological progress, also in Germany, regarding the automation of in-car support systems and connectedness between vehicles. Car-to-car communications systems shall help increase the overall traffic security, for instance, through enabling vehicles that are driving ahead to warn the following cars of accidents, narrow lanes or obstacles behind a curve.

While German automotive manufacturers and suppliers and their development departments attach very great relevance to this segment, it is mostly traditional IT system houses and their consultants that are actively engaged in projects in the German market. Interestingly, Vodafone has joined this group of providers, based on the company's high strategic focus on and related investments in this segment.

Evaluation of Providers

Experton Group has identified 17 relevant providers of **consulting & integrations services - connected cars** for the German market. The following 7 of these providers have been positioned as leaders:

- Accenture
- Atos
- Capgemini
- Deutsche Telekom
- HPE
- IBM
- Vodafone

Tech Mahindra is the Rising Star of this segment.

Figure 26: Quadrant for consulting & integration – connected cars

Category: Consulting & Integration – Connected Cars

Accenture

Strengths:

- For years, Accenture has been positioned as an independent consulting house with leading integration know-how and top consultants in the connected cars technology segment.
- Accenture has clear show cases for connected car projects, also in Germany.

Challenges:

- The American provider could position their expertise and portfolio in the German market more clearly.

Trend assessment:

NEUTRAL

Advisor Statement

"Based on their position as an established provider of integration services for the automotive sector and focussed connected-car projects, Accenture is clearly among the market leaders in this segment."

Category: Consulting & Integration – Connected Cars

Atos

Strengths:

- Atos has successfully positioned their connected car integration competence and portfolio in the German market and has top references.
- Atos is a leading provider of smart, predictive security systems and sensor-based support systems.

Challenges:

- Atos could intensify respective efforts to market their connected car capabilities. On the German web site, no focus on the automotive sector can be perceived.

Trend assessment:

NEUTRAL

Advisor Statement

"Atos has an innovative solution portfolio, with a specific focus on car-to-car communications, and has very good references in the German market."

Category: Consulting & Integration – Connected Cars

Capgemini

Strengths:

- Capgemini has first-class know-how and is actively engaged in marketing measures such as an annual "Cars Online" report to achieve a thought leadership position in the connected cars segment
- The French provider has experienced advisors, integration competences and a strong customer base in the German automotive sector.

Challenges:

- As of to date, Capgemini has no German references for specific IoT connected car use cases.

Trend assessment:

NEUTRAL

Advisor Statement

"Capgemini is among the established integrators in the automotive industry and can advise customers, based on comprehensive thought leadership material within the connected car context."

Category: Consulting & Integration – Connected Cars

Deutsche Telekom

Strengths:

- Deutsche Telekom provides consulting and integration services, based on a very broad, modular portfolio.
- Deutsche Telekom's IT development and digitization initiatives are based on very close connections to the three large OEMS and their supplier network.
- Deutsche Telekom has strong references, including direct connected car installations, OEMs in Germany and the Federal Ministry of Transportation.

Challenges:

- Deutsche Telekom's strong capabilities in the B2B segment are marketed on the separate T-Systems web site. An intuitive navigation would ensure easier access for users.

Trend assessment:

NEUTRAL

Advisor Statement

"Deutsche Telekom has a broad integration and consulting offering and has close connections to German OEMs, also within the context of innovation initiatives."

Category: Consulting & Integration – Connected Cars

HPE

Strengths:

- HPE is a very experienced, globally connected provider of integration services in the automotive industry with strong global references, including OEM Ford, who have production facilities in Germany.
- HPE positions their IoT portfolio through innovative show cases, for instance, real-time localization of vehicles in cooperation with the police of Dubai and data management for a Formula E racing team.

Challenges:

- A better structured and marketed IoT portfolio in Germany could help strengthen the provider's position.

Trend assessment:

NEUTRAL

Advisor Statement

"HPE positions their IoT portfolio through innovative show cases, for instance, real-time localization of vehicles in cooperation with the police of Dubai and data management for a Formula E racing team."

Category: Consulting & Integration – Connected Cars

IBM

Strengths:

- For three years, IBM has developed solutions for the “anticipating” vehicle, in cooperation with Continental, a German tire manufacturer.
- IBM is striving to achieve a thought leadership position through cooperation with Local Motors. The self-driving vehicle “Meet Olli” will be equipped with Watson intelligence by IBM.
- IBM enjoys a very high degree of awareness in this segment and has references in the German market.

Challenges:

- IBM’s marketing of the provider’s innovative connected car portfolio via the German web site could be improved.

Trend assessment:

NEUTRAL

Advisor Statement

“Based on the self-driving vehicle ‘Meet Olli’, IBM provides a very innovative portfolio and is well connected with German suppliers and OEMs.”

Category: Consulting & Integration – Connected Cars

Tech Mahindra (Rising Star)

Strengths:

- Tech Mahindra provides a broad portfolio of connected car solutions for infotainment, telematics and analytics to control automotive components.
- Tech Mahindra has a clear focus on marketing their consulting competence. For instance, consultants are regular contributors in international magazines for the automotive sector.
- The Indian provider can demonstrate first projects with German OEMs and suppliers.

Challenges:

- So far, no strategic focus on Industrie 4.0 for connected car solutions can be perceived.
- Tech Mahindra does not provide an automotive solution for a fully automated Industrie 4.0 use case.

Trend assessment:

POSITIVE

Advisor Statement

"Tech Mahindra combines a clear focus on their own consulting competency with a broad scope of components for connected-car use cases."

Category: Consulting & Integration – Connected Cars

Vodafone

Strengths:

- Vodafone is establishing a unit consisting of highly specialized advisors and a broad portfolio to achieve a leadership position in the market for connected car services.
- Vodafone has show cases and strong references with renowned OEMs and suppliers, also in the German market.

Challenges:

- Vodafone could strengthen their position in the German market through a web site in German language and more active marketing efforts.

Trend assessment:

POSITIVE

Advisor Statement

"Vodafone has a strong strategic focus on the connected car segment, which is reflected in respective investments, workforce expansions and a strong portfolio, further substantiated by solid references."

	Consulting and Integration / Connected Cars								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩ ⇔ ⇧
Accenture	0	0	0	0	0	0	0	0	⇧
Atos	+	0	0	0	0	0	0	0	⇔
Capgemini	+	+	0	0	0	0	0	0	⇔
CGI	0	0	-	-	0	0	0	0	⇔
Cognizant	0	0	0	0	0	0	0	0	⇔
CSC	+	0	+	0	-	-	0	-	⇔
Deutsche Telekom	+	0	0	0	+	+	+	+	⇔
HCL	-	-	-	-	-	0	-	-	⇔
HPE	0	0	0	0	+	+	+	+	⇧
IBM	+	+	0	0	0	+	0	0	⇔
Infosys	0	0	0	0	-	-	0	0	⇔
NTT Data	+	0	0	0	-	-	-	-	⇩
TCS	-	-	-	-	0	0	-	0	⇔
Tech Mahindra	0	0	0	0	0	0	0	0	⇧
UNITY	0	0	0	0	0	0	0	0	⇧
Vodafone	+	+	-	0	0	+	0	0	⇧
Wipro	+	0	+	0	0	0	0	0	⇔

Figure 27: Overview of providers of consulting & integration services - connected cars with trend forecast

3.10 Consulting & Integration – Smart Energy Management for Buildings

Introduction

Interest in the connected home topic has decreased in the media. Major technical developments can be observed in the industrial facility management sector. Smart connectivity of building technology shall help improve the energy efficiency, the security and the living comfort. Only very few completely connected solutions are currently available. Current developments have a key focus on energy management for buildings. Facility managers are attempting to gain a competitive advantage in this very competitive market with low margins by reducing energy consumption through automated efficiency improvements.

Within this segment Experton Group analyzes solutions and integration services for energy management and the automated optimization of energy, gas and water consumption for commercial facility management.

Key evaluation criteria and requirements for providers of smart energy management solutions (integration & consulting) can be summarized as follows:

- Strategy and vision
- Thought leadership (events, white papers, etc.)
- Strategic I4.0 & IoT focus
- Breadth of portfolio: scope of consulting & integration services
- Local specifics: product support, infrastructure
- Consulting portfolio (business/technology)
- Degree of awareness & image
- Core competencies
- Go-to-market strategy
- References
- Technology partner landscapes

This market is populated by traditional providers of IT integration services such as Atos and IBM as well as specialized companies with direct facility management access such as Caverion, Kiwigrid and Siemens Gebäudeautomation.

Experton Group has identified 12 companies as relevant providers of **consulting & integration – smart energy management for buildings** solutions in the German market, including seven leaders:

- Atos
- Bosch SI
- Caverion
- Device Insight
- IBM
- Kiwigrid
- Siemens

QSC is the Rising Star of this segment.

Figure 28 Quadrant for consulting & integration – smart energy management for buildings

Category: Consulting & Integration – Smart Energy Management for Buildings

Atos

Strengths:

- Atos' Connected Home portfolio provides energy management consulting and integration services.
- The French provider has good references in the German market.

Challenges:

- Atos could work to increase the transparency of their Industrie 4.0 portfolio, including the connected home and energy management solutions, and to also intensify related marketing efforts.

Trend assessment:

NEUTRAL

Advisor Statement

"Atos' Connected Home portfolio includes energy management consulting; the provider has good references in the German market."

Category: Consulting & Integration – Smart Energy Management for Buildings

Bosch SI

Strengths:

- Bosch SI provides a modular portfolio for automated energy management control.
- With Junkers & Co Bosch owns a leading provider of thermal technology, including the integration and control of solar and thermal energy as well as ventilation to reduce energy costs.
- Bosch SI presents well-prepared flagship projects within the European market and cooperates with a German heating manufacturer to market their portfolio.

Challenges:

- The company has implemented only few energy management projects in buildings for the German market.

Trend assessment:

POSITIVE

Advisor Statement

"The Bosch SI portfolio includes the integration and control of solar and thermal energy systems as well as ventilation to reduce energy costs."

Category: Consulting & Integration – Smart Energy Management for Buildings

Caverion

Strengths:

- Caverion is a leading provider of consulting and operational facility management services, including energy management, in Germany.
- The energy management portfolio also includes new analytics tools such as scatter diagrams that can be used for the early detection of maintenance needs for heating systems.
- The provider has good references and show cases in the German market.

Challenges:

- The provider faces strong competition from leading IT service providers that enjoy a higher degree of awareness among IT managers.

Trend assessment:

NEUTRAL

Advisor Statement

"Caverion is a leading provider of consulting and operational facility management services, including energy management, in Germany and offers interesting solutions that help increase the efficiency of heating systems."

Category: Consulting & Integration – Smart Energy Management for Buildings

Device Insight

Strengths:

- Based on their proprietary IoT platform, Device Insight provides an interesting solution for monitoring and controlling energy needs in enterprises with a large network of branches.
- This solution has been developed in cooperation with the building automation specialist Hörburger and is leveraged for large-scale usage by two customers in Germany. These show cases have been prepared as flagship projects and are marketed accordingly.

Challenges:

- Stronger marketing of the provider's energy management competences could increase the momentum even further.

Trend assessment:

POSITIVE

Advisor Statement

"Device Insight provides a broad portfolio of interesting components, such as the solution for monitoring and controlling energy needs in enterprises with a large network of branches."

Category: Consulting & Integration – Smart Energy Management for Buildings

IBM

Strengths:

- IBM's "Watson IoT for Buildings" is a solution for analyzing sensor data and for integration with facility management software for energy management optimization purposes.
- IBM has engaged in strong partnerships in Germany, including Siemens Gebäude Technologie and ISS Facility Management.

Challenges:

- As of to date, IBM has no references in the German market where the IT service provider is directly engaged with end customers.

Trend assessment:

NEUTRAL

Advisor Statement

"IBM's 'Watson IoT for Buildings' is a solution for analyzing sensor data and for integration with facility management software for energy management optimization purposes."

Category: Consulting & Integration – Smart Energy Management for Buildings

Kiwigrid

Strengths:

- Kiwigrid has a broad energy management optimization and automation portfolio for building management purposes.
- The energy management specialist has strong connections to the German power generation industry and has many references in the energy sector.

Challenges:

- Kiwigrid's degree of awareness as a provider of industrial building management solutions for facility management is relatively low.

Trend assessment:

NEUTRAL

Advisor Statement

"Kiwigrid has a broad energy management optimization portfolio for building management purposes. The energy management specialist has strong connections to the German power generation industry."

Category: Consulting & Integration – Smart Energy Management for Buildings

QSC (Rising Star)

Strengths:

- QSC's subsidiary Q-Loud provides a broad portfolio of consulting and integration services for energy management, including their own hardware to control heating elements or measure the atmospheric humidity.
- The network provider is building up an effective ecosystem of partners from the energy management and heating engineering sectors and IP technology suppliers such as Huawei.

Challenges:

- Available solutions provide advanced digitization and analytics functionality, but no fully automated Industrie 4.0 use cases yet.
- While QSC has a good momentum and is increasing their customer base in this segment, the provider still lags behind leading competitors.

Trend assessment:

POSITIVE

Advisor Statement

"QSC's subsidiary Q-Loud provides a broad portfolio of consulting and integration services for energy management, including their own hardware to control heating elements or measure the atmospheric humidity."

Category: Consulting & Integration – Smart Energy Management for Buildings

Siemens

Strengths:

- Siemens Gebäude Technologie's Navigator platform enables users to control energy needs and supply and perform eco-friendliness measurements.
- The incumbent German industry giant has a strong position in the energy management and building technology sectors and has a very broad customer base in Germany.

Challenges:

- Despite the provider's size and experience, Siemens' degree of awareness among IT managers as a consulting and integration service provider is relatively low.

Trend assessment:

NEUTRAL

Advisor Statement

"Siemens Gebäude Technologie enables user to control their energy needs. The incumbent German industry giant has a strong position in the energy management and building technology sectors and has a very broad customer base in Germany."

	Consulting and Integration / Smart Energy Management for Buildings								
	Portfolio Attractiveness (Y-Axis on Grid)				Competitive Strength (X-Axis on Grid)				Advisor Trend
Categories Player	Strategy & Vision	Features / Portfolio depth	Architecture & Service Design	Client Experience	Sales & Marketing	Innovation Capacity & Viability	Strategy & Local Reach	Awareness & Image	⇩ ⇔ ⇧
Atos	+	0	0	0	0	0	0	0	⇔
BEDM	+	0	0	0	0	0	0	0	⇧
Bosch SI	0	0	0	0	0	0	0	0	⇧
Caverion	0	0	0	0	0	0	0	0	⇔
Device Insight	0	0	0	0	0	0	0	0	⇧
Green Pocket	0	-	0	0	0	0	0	0	⇧
GreenCom Network	-	0	-	0	0	0	0	-	⇔
IBM	0	0	0	0	0	+	0	0	⇔
Kiwigrid	+	0	0	0	0	-	0	0	⇔
QSC	+	-	0	0	-	0	-	0	⇧
Siemens	0	0	0	0	+	+	+	+	⇔
Tech Mahindra	0	0	0	0	-	0	-	0	⇔

Figure 29: Overview of providers of consulting & integration services - smart energy management for buildings with trend forecast

4. AUTHORS AND CONTACT

Arnold Vogt is a Senior Advisor at Experton Group.

Mr. Vogt advises ICT vendors and users on current IT service topics such as cloud computing and Industrie 4.0 (Internet of things & services). His focus is on strategic marketing and sales development through the analysis of customer requirements, competitors and technologies and on market segmentation and evaluation.

Prior to joining Experton Group, Mr. Vogt worked as Senior Market Development Advisor for IBM Deutschland GmbH, where he was responsible for market and competitive analyses on cloud computing, IT services and business strategies.

After completing his studies of business administration with a focus on marketing Mr. Vogt worked in IBM's marketing department for 15 years and held various positions with national and international responsibilities. In 2010 he completed his part-time MBA studies at the Henley Business School (University of Reading, UK); his thesis was about the diffusion of innovations and dealt with the question "What makes innovations successful in the market?"

Holm Landrock is a technical journalist and Senior Advisor/Topic Leader Big Data at Experton Group.

His main areas of coverage include big data and supercomputing as areas of IT application as well as technical-scientific information processing. His tasks within the big data context include consulting projects for user organizations, vendor benchmarks and multi-client studies on big data analytics.

Since 2006, Mr. Landrock has worked as a freelance journalist; before, he worked as a journalist and PR consultant for global IT companies.

Holm Landrock has completed training as an IT specialist in Dresden; since 1982, he has studied enterprise-class IT systems. Mr. Landrock has published numerous IT articles and is a speaker on user, vendor and other IT events. He is also the author and co-author of various IT books.

Dr. Henning Dransfeld is Manager Advisor & Program Manager Mobile Enterprise at Experton Group.

Dr. Dransfeld advises both ICT users and ICT vendors; his main areas of coverage include the mobile enterprise with a focus on issues such as client strategy, mobile productivity, security and employee motivation. Dr. Dransfeld is a recognized expert for ICT trend analyses, vendor strategy evaluation and competitive positioning and has more than 18 years of industry experience. Dr. Dransfeld also advises ICT users on their core marketing and sales messages.

Prior to joining Experton Group, Dr. Dransfeld worked as head of Forrester Research's Mobile Enterprise unit in Europe. In this position, he published various analyses on current mobility topics, including “Demystifying BYOD in Europe”.

Before, he worked for T-Systems. Within eight years, he held a variety of positions as marketing, sales strategy and business strategy project manager. Most recently, he was responsible for T-Systems' solution marketing for mobile enterprise and workplace services.

Before, Dr. Dransfeld worked six years as an analyst for Ovum in London, where he was head of the IP Communications Services advisory service. He was responsible for numerous studies and forecasts, including IP communications services, and acted as Research Director for the ICT Network Strategy division.

Dr. Henning Dransfeld is an experienced speaker on international conferences, such as the European VPN User Association (EVUA) and the European IPQC Mobility Exchange.

Dr. Dransfeld has studied at Henley Business School, the University of Wales, Swansea and the Université 1, Institut de Gestion, Rennes. He is married and has four children.

EXPERTON GROUP

Experton Group is the leading fully integrated research, advisory and consulting company. Experton Group supports large enterprises as well as midmarket businesses with their IT strategic planning and implementation through innovative, neutral and independent consulting and advisory services to help them maximize the business value of their ICT investments.

Experton Group provides market research, advisory services, assessments, benchmarks, conferences, seminars and publications on information and communications technology topics. The scope of services includes technology, business processes, management and M&A.

Experton Group was founded in 2005 by very experienced market research and consulting experts; in March 2016, Experton Group became a subsidiary of Information Services Group.

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