

Industrial IoT Transformation

Realizing value in short- and long-term

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Industry 4.0 Maturity Index; source: Infosys..... 7

1. INTERNET OF THINGS: REALITY & VISION

Addressing the reality in short term: silos within companies and IT

Nowadays, the term IoT or Internet of Things is well-known across many industries, but in particular you see a big adoption of IoT, in manufacturing. The Internet of Things is a fundamental technology, which is becoming the infrastructure for communications and aggregated added-value. This additional intelligence enables products to collect, share, and process data and act on data insights accordingly – they are turning into “smart products”. The IoT is a key technology and enables manufacturing companies to digitalize and further integrate processes, products and services.

But not all manufacturers have realized the necessity for this transformation. Most of them are still in the early stages of their digital transformation. PAC particularly sees digital ecosystems emerge in the ‘Internet of Things’ environment, or better put: in the ‘Internet of Things and Services’ - as it is usually the service around connected ‘things’ that is providing value to customers. Players in these digital ecosystems might involve IT companies, telco carriers, Internet giants, utilities, manufacturing companies, financial services firms, industrial consortia or associations, research institutions or even consumers themselves.

The “silo mentality” often restricts the digital transformation process. Product development, production and service departments not sharing information with each other creates a lack of transparency which leads to reduced efficiency of the overall operation. The reason for that is simple, each department focuses only on the own domain and not on the whole process. IT can help to overcome this, but today it is more part of the problem as we see in IT similar silos as in the organization.

Vision: become a digitally integrated enterprise through IoT in the long-term

Manufacturers have moved into the center of the emerging next generation of digital transformation concepts. And they have evolved as enablers or solution providers in this field. From this perspective, manufacturers should still perceive digital transformation as a tremendous opportunity to respond to increasingly fierce competition, change the balance of power in the value chain to their own benefit, and open up new revenue sources.

In PAC’s point of view, a digital integrated enterprise has an integrated end-to-end customer centricity, the digitalization and integration of backend and frontend processes, cross-functional data intelligence and analytics as well as a company-wide innovation culture. This will be possible with the help of the Internet of Things. By using IoT-based solutions manufacturers are given the opportunity of streamlining their operations by connecting their assets to the internet and generating data from them, as well as from processes and their customers. This data can be processed and/or monetized, resulting in cost reductions or development of new products, services or business models. Areas of application for IoT solutions range from shop floor operations over workforce mobility to embedding connectivity devices in products.

2. CLIENT ROADMAP: INTEGRATION WITHIN AND ACROSS COMPANY SILOS

Short-term: drive digital integration within silos to the next level (1-2 years)

Digital integration means integrated, end-to-end customer centricity, cross-functional data intelligence, established innovation culture and collaboration across the company. Furthermore, processes have to be digitally enabled and digital backend as well as frontend solutions have to be technically integrated. With the help of deep digital integration, it is possible to drive the organization development forward. But digital integration across a whole company is a project that takes a more long-term effort, not only regarding investments in IT but also regarding the company culture. Therefore, a wise first step is to start the digital integration within the existing silos.

To digitally integrate silos within an organization a strong IT department in a central position is needed which is able to coordinate and integrate different digital initiatives based on a holistic strategy as well as to bundle, orchestrate and further analyze company-wide data streams. It also has to accelerate agility and innovativeness. An effective tool to optimize the different silos is to use IoT technology. The IoT-enabled silos are building the base for further digital integration. Therefore, it's important to have the bigger picture in mind right from the beginning. Without this, it's likely that the silos sustain and the organizational development will reach its limits quite soon.

Long-term: drive digital integration across silos around the concept of a digital twin (3-5 years)

The concept of a digital twin is related to the virtual representative of a physical product, which is designed to digitally support the whole product lifecycle – from virtual product testing and simulations, through virtual configuration of production lines and production simulations, to the digital use of a product by the client combined with digital services and support.

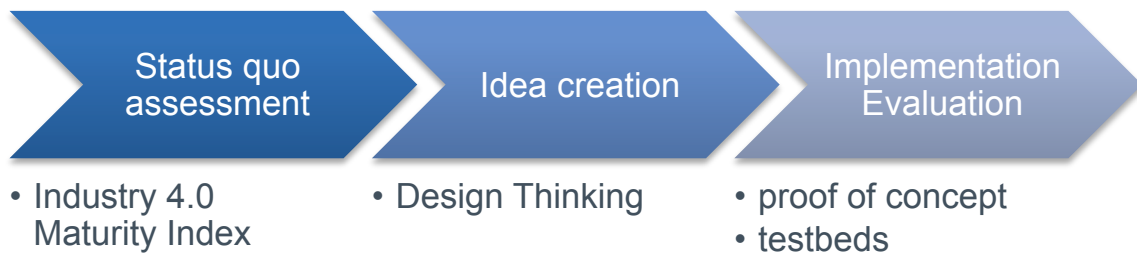
Today, bits and pieces related to digital twins can be seen in the market, especially in the space of virtual product testing and simulations. However, a really integrated digital twin that brings all pieces together is hard to find and the concept is clearly not easy to realize. The roadmap to a digital twin will be more like a journey for the manufacturing industry, integrating more and more pieces into one holistic concept.

To make this vision a reality, the starting point for a digital twin is a 3-D model of a physical product, created in CAD, and the end point is the IoT-connected product used by the client. But a digital twin is not only based on HW-related engineering data (from CAD) and product-usage data (from the IoT). The increasing requirements of embedded SW engineering (ALM) also have to be taken into account in the concept of a holistic product lifecycle management (PLM) approach – or, in other words, a digital twin. The integration of all these, often already existing, building blocks (CAD, PLM, ALM, IoT) within a

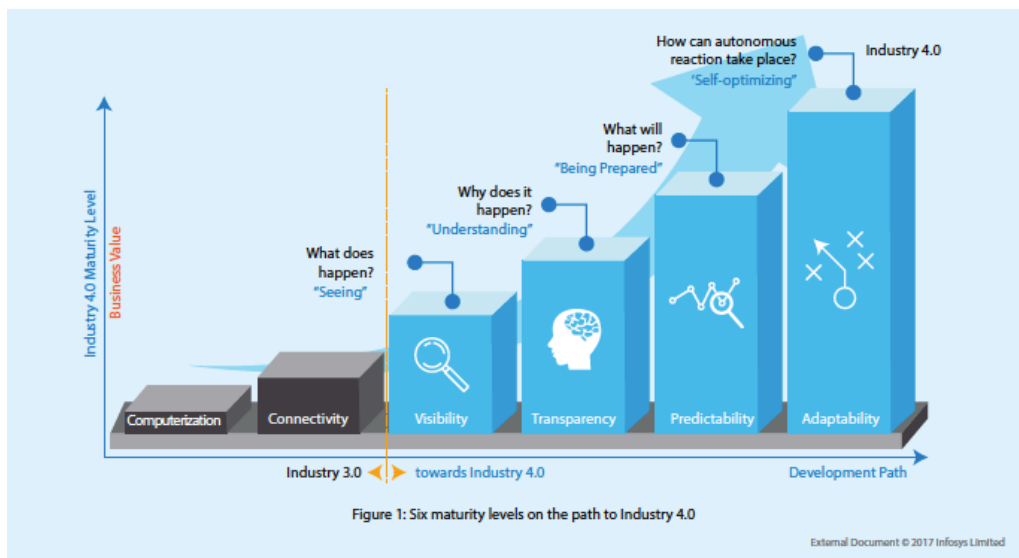
manufacturing company is the difficult task ahead. But there is a clear potential to reach a competitive advantage over competitors in the race to the digital transformation of the manufacturing industry.

When you start bottom-up with small projects around simulation, PLM, ALM or IoT to realize the concept of a digital twin, you should always have the bigger picture in mind, i.e. that you have to progressively integrate these elements to reach the target.

3. HOW TO START



Status quo assessment: Industry 4.0 Maturity Index



Industry 4.0 Maturity Index; source: Infosys

To identify in which stage of transformation a company is, it can use the Industry 4.0 Maturity Index. The index assesses the company from a cultural, organizational and technological perspective with a focus on the business processes of manufacturing companies.

The first step is to analyze the company's current situation and the goals it wants to achieve. Therefore, the following questions should be asked:

- What are the strategic objectives for the next few years?
- What technologies and systems are already implemented?
- How do these technologies and systems operate within the company?

The answers to these questions allow to determine the capabilities, which are needed in order to successfully introduce Industrial IoT. It is noteworthy that a successful transformation does not happen overnight but in stages. The company must make a strategic decision about the specific benefits it wishes to achieve as well as its priorities and the sequences in which the relevant measures will be implemented.

Based on this methodology, the result is the formulation of a digital roadmap, which includes all relevant areas. A step-by-step approach is necessary to achieve the benefits in order to reduce the investment and implementation risks for the company. This digital roadmap shows the company the importance of developing a common digital strategy for the whole business.

The Industry 4.0 Index contains four levels of maturity. Computerization and connectivity are considered as “Industry 3.0” and are building the base for the four Industry 4.0 levels:

- **Visibility** – monitoring processes from the beginning via sensors in real-time. The result is an up-to-date digital model of factories at all times (digital shadow);
- **Transparency** – root cause analysis and applying engineering knowledge to support complex and rapid decision-making;
- **Predictive capacity** – ability to simulate different future scenarios and identify the most likely ones as well as the base for automated actions and decision-making. The result is the ability of the company to anticipate future developments in order to make decisions in time;
- **Adaptability** – degree of adaptability depending on the complexity of the decisions and the cost-benefit-ratio. If the company is able to use data from the digital shadow to make decisions that lead to the best possible results in the shortest possible time and to implement the corresponding measures automatically, the goal is achieved.

It's important to mention, that every stage builds up on the previous stage. For a successful application of the index, the four stages should be followed step-by-step in order to achieve the maximum benefit.

Idea creation: Design Thinking to develop, evaluate and priorities ideas

After the first step of identifying the status quo with the help of the Industry 4.0 Maturity Index, the next logical step is to think about what has to change, how to change it and act. Due to the fact that the transformation towards Industrial IoT is a complex task, there can occur several problems during the process. To tackle these tasks, it is advisable to use a solution-based problem-solving approach such as Design Thinking. With this 5-stage methodology it's possible to counter complex problems that are ill-

defined or unknown, by understanding the human needs involved, re-framing the problem in human-centric ways, creating many ideas in brainstorming sessions, and by adopting a hands-on approach in prototyping and testing.



Empathize: understanding the human needs involved

Define: re-framing and defining the problem in human-centric ways

Ideate: creating many ideas in brainstorming sessions

Prototype: adopting a hands-on approach in prototyping

Test: developing a prototype / solution to problem and test it

Implementation Evaluation: Proof of Concept & Testbeds around dedicated Industrial IoT use cases

The third step, after the successful evaluation of the status quo and the design thinking process, is to perform a proof of concept and testbeds around dedicated Industrial IoT use cases in order to evaluate if the developed use case during the design thinking process can be realized.

Here, the first step is to prove if the Industrial IoT use case can be realized from a technical point of view with the help of a testbed, a controlled experimentation platform. The Industrial Internet Consortium (IIC), one of the world's leading organization for Industrial IoT, offers such testbeds. The members of the consortium include Infosys and other big players in the Industry. IIC provides necessary infrastructure and support to implement specific use cases and scenarios. Results of testbed will help assess the technical feasibility for full-fledged implementation. It is also possible to evaluate the interoperability of untested or existing technologies. Ideally, these generate new and potentially disruptive IoT services and products. These concepts of new services and products have to be proved in order to enhance the maturity of the Industrial IoT use cases and bring it closer to industrial applications.

4. WHY INFOSYS?

Industry expertise

Infosys' strategic business planning gives strong focus to the fact that Industry 4.0 is now transforming manufacturing enterprises across the globe i.e. aerospace, automotive, heavy engineering, energy and utilities, mining and other industrial sectors. This development is characterized by a fusion of technologies in the form of Cyber-Physical Systems (CPS) driven by automation and connectivity incorporating automated decision making in real-time by analyzing all relevant information.

With the intention of helping clients understand and unlock new value potential of disruptive Industry 4.0 technologies, Infosys as founder member of the Acatech consortium of scientific and leading industry partners developed the Industry 4.0 Maturity Index (I4.0MI).

Infosys developed a deep Industrial IoT expertise and can successfully support its customers during the transformation process towards a smart connected enterprise. The focus of the company lays on vertical offerings, IP's and platforms. For Infosys, real-time visualization and processing capability, interoperability, virtualization, decentralization, service orientation and modularity are key for efficiency improvement and the development of new business models in order to increase competitive advantage by Industrial IoT. Therefore, Infosys is concentrating on four pillars:

- Smart products: intelligent products equipped with more ICT, offering individual and customized variants to your customers & enhanced products to collect data on their environment and own status due to end-to-end digitalization;
- Smart services: new service models for business lines based on smart data given by smart products and smart factories and increased customer satisfaction and loyalty due to clear focus on customer-centric value creation;
- Connected factory: highly inter-connected production enabled by networked, autonomous and decentralized production systems & seamless interoperability enabling optimal convergence of digital and physical within the factory.
- Smart Production: higher productivity through digitally supported continuous processes and real-time planning and scheduling & highly efficient and optimized production with increased transparency and real-time access to all relevant data.

Technology strength - Infosys Nia

Infosys Nia is a knowledge-based Artificial Intelligence platform to help organizations to increase the efficiencies of assets in the manufacturing shop floor. Nia is built on open source technologies with various modules like M2M to connect to hardware devices, IIP (Infosys Information Platform) for storing and processing large amount of data, IKP (Infosys Knowledge Platform) to capture and process knowledge

and IAP (Infosys Automation Platform) to automate processes. Within one year, Infosys was able to win 50+ clients and 150+ engagements across all industry sectors.

Infosys Nia brings machine learning together with the deep knowledge of an organization to drive automation and innovation. This enables businesses to continuously reinvent their system landscapes and lowers the cost of maintenance for both physical and digital assets. It captures the knowledge and know-how of people across fragmented and complex systems, and simplifies the continuous renovation of core business processes. Infosys Nia can also be integrated on any of the commercial off-the-shelf IoT Platforms i.e. GE Predix, Azure IoT, Watson IoT, ThingWorx, AWS IoT or any other platforms.

Leveraging partner ecosystem

Infosys has established a broad partner ecosystem over the past years with best of breed technology providers. This ecosystem comprises intelligent devices, connectivity, device management enterprise integration and analytics. Infosys positions itself as an Eco-System Integrator whose focus is to help customers realize business cases from use cases.

Infosys simplifies the fragmented technology provider landscape of IoT as below:

- Intelligent Devices - Intel, Digi, MuRata, ILS technology
- Connectivity - Sierra Wireless, ILS Technology, Vodafone, AT&T, Digi
- Device Management - ThingWorx, Bosch, GE, Microsoft, IBM, AWS IoT
- Enterprise Integration - SAP, Hitachi, IBM, Oracle
- Analytics - Microsoft Azure, SAS, IBM, Tableau

Such a partner ecosystem will be key for the success in the future, because competitive advantages will no longer be determined by the strength of a single company but by the strength of the ecosystem it operates in. And this is true not only for dominating platform operators but also for the players attached to an ecosystem or platform. Future success will be determined by “the ability to leverage and orchestrate a global connected ecosystem of producers and consumers toward efficient value creation and exchange.”

Proven capabilities

Infosys can show several proof points for their strong IoT capabilities. To support companies to embrace Industrial IoT, Infosys partners with KUKA, one of the world’s leading automation companies, with its headquarter in Germany with the aim to develop solutions to support their customers in the transformation process. The aim of the collaboration is the development of a software platform that will allow customers to collect, evaluate and utilize data for improving their own processes. KUKA will work to extend the connection of machines with the Cloud by establishing an Industrial IoT Cloud Platform. These software and services will be developed by a newly established subsidiary of Kuka, connyun (“connect” + “yun”, the Chinese term for cloud).

Furthermore, Infosys supports customers in the automotive industry and energy sector with predictive maintenance solutions in order to reduce costs as well as increase efficiency and up-time. Other successful projects are smart connected chillers, home security and automation products, smart farming solution for world leading seed-company, telematics device for user-based insurance, a smart vending solution for a major US CPG vendor, a connected stadium solution, and many more.

ABOUT INFOSYS

Infosys is a global leader in technology services and consulting. We enable clients in 45 countries to create and execute strategies for their digital transformation. From engineering to application development, knowledge management and business process management, we help them find the right problems to solve, and to solve these effectively. Our team of over 198,000+ innovators, across the globe, is differentiated by the imagination, knowledge and experience, across industries and technologies, that we bring to every project we undertake. The way we innovate is through Zero Distance: a ground-up, grassroots approach to ensure that every developer, manager, analyst and architect is at 'Zero Distance' – to the end user, to the underlying technology, and therefore to the value.

We believe our responsibilities extend beyond business. That's why we established the Infosys Foundation USA to bridge the digital divide in America. Infosys Foundation in India provides assistance to some of the most economically depressed communities in which we work. In addition, the Infosys Science Foundation awards the Infosys Prize to the most important research of our times in the sciences and the humanities.

Visit www.infosys.com to see how Infosys (NYSE: INFY) can help your enterprise thrive in the digital age.

ABOUT PAC

Founded in 1976, Pierre Audoin Consultants (PAC) is part of the CXP Group, the leading independent European research and consulting firm for the software, IT services and digital transformation industry.

The CXP Group offers its customers comprehensive support services for the evaluation, selection and optimization of their software solutions and for the evaluation and selection of IT services providers, and accompanies them in optimizing their sourcing and investment strategies. As such, the CXP Group supports ICT decision makers in their digital transformation journey.

Further, the CXP Group assists software and IT services providers in optimizing their strategies and go-to-market approaches with quantitative and qualitative analyses as well as consulting services. Public organizations and institutions equally base the development of their IT policies on our reports.

Capitalizing on 40 years of experience, based in 8 countries (with 17 offices worldwide) and with 140 employees, the CXP Group provides its expertise every year to more than 1,500 ICT decision makers and the operational divisions of large enterprises as well as mid-market companies and their providers. The CXP Group consists of three branches: Le CXP, BARC (Business Application Research Center) and Pierre Audoin Consultants (PAC).

For more information please visit: www.pac-online.com

