

INDUSTRY 4.0

Transforming the Future of Manufacturing.

April, 2018

The manufacturing industry is undergoing significant transformation as technologies such as IoT, 3D printing, robotics process automation, and AI are enabling real time connections between customers and the plant.

WHAT IS IT?

Industry 4.0, often referred to as Manufacturing 4.0, or Industrial Internet represents the fourth industrial revolution. The initial stages of this revolution trace back to 2011 in Hannover, Germany and has since then permeated throughout the world. New and continuously evolving digital technologies are disrupting and reshaping the manufacturing industry by igniting new relationships and interactions across the entire manufacturing value-chain. Traditional processes such as demand management, design, make, deliver and maintain are being reinvented to enable mass customization and customer centricity. At the same time, intelligent platforms characterized by deep learning are driving significant efficiencies across the entire supply chain while blurring the boundaries between virtual and real worlds at the production operations level.

Technology disruption also creates new value opportunities as businesses create new and intelligent connections with suppliers, and third parties globally. By combining sensory technologies with real-time analytics and dynamic customer experiences, supply chain managers can dramatically increase efficiencies and responsiveness seeing further upward and downward into their supply chains than ever before.

Product engineering itself is undergoing a dramatic shift. Highly tuned customer experiences and real-time, personalized engagement models allow customers to step right into product engineering departments and often drive critical design decisions on a real-time basis.

WHAT'S DIFFERENT

Industry 4.0 represents a significant shift in the organization and management of manufacturing and supply-chain processes. While using technology to make production processes more efficient is not new, creating digital ecosystems comprised of intelligent machines that interconnect and share real-time data is. So is the use of real-time customer demand data to dynamically tune production processes.

There are significant differences between traditionally connected and Industry 4.0 factories. In a traditional factory, providing quality services or products at the lowest cost is a key success factor. To achieve this, many data sources are available to provide actionable information about the production process. Using data to understand current operating conditions and detect faults or failures has been one of the key focus areas for manufacturing companies.

Beyond traditional condition monitoring and fault diagnosis, intelligent platforms and systems in an Industry 4.0 factory have an entirely different focus. Key characteristics include:

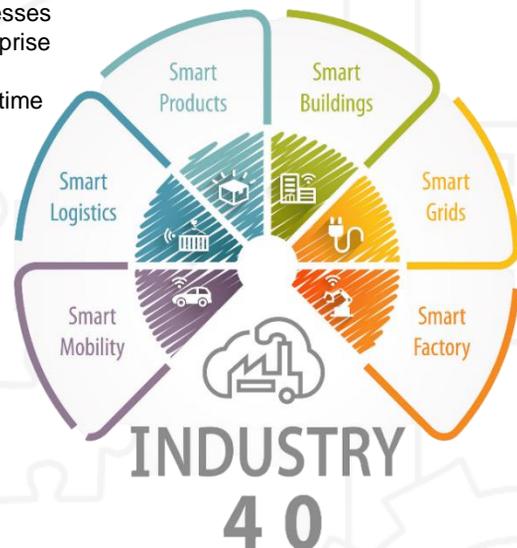
- **They demonstrate self-awareness** – platforms are self aware of the current state of a manufacturing process,
- **They possess real-time predictive capabilities** – real-time data is leveraged to drive process prediction and thus enable continuously shifting actions to optimize production operations,
- **They are interconnected with each other** – systems and technology communicate with each other, not only at the factory level, but far beyond enterprise boundaries, to discover how end products are utilized. The use of IoT sensors that connect back through wired and wireless connections in real-time is a key component of an Industry 4.0 strategy, and
- **A high level of automation** – real-time data enables real-time analytics which drive real-time automation of activities across all production and supply chain processes.

“Industry 4.0 has the potential to affect entire industries by transforming the way goods are designed, manufactured, delivered and serviced.”

SMART INTERCONNECTIONS

While Industry 4.0 is often focused on creating intelligent factories. Businesses are recognizing that smart connections must extend beyond internal enterprise boundaries to create powerful interactions with customers and partners upstream and downstream into the supply chain. The goal is to drive real-time connections with people and things to enable intelligent information gathering on usage, demand and product quality.

Smart technologies such as IoT, enable connections upstream in the supply chain which in turn drives intelligent and dynamic improvements at the factory level and downstream in the supply chain. Not surprisingly, many companies are implementing smart devices into every possible component of their end products.



HORIZONTAL VALUE CHAIN INTEGRATION

One of the main enablers of this fourth industrial revolution is the incorporation of digital transformation technologies to define cyber-physical production systems (CPPS) as main actors in the production schema. Within modularly structured smart factories, CPPSs monitor physical processes, create a virtual copy of the physical world and enable decentralized monitoring and decision making.

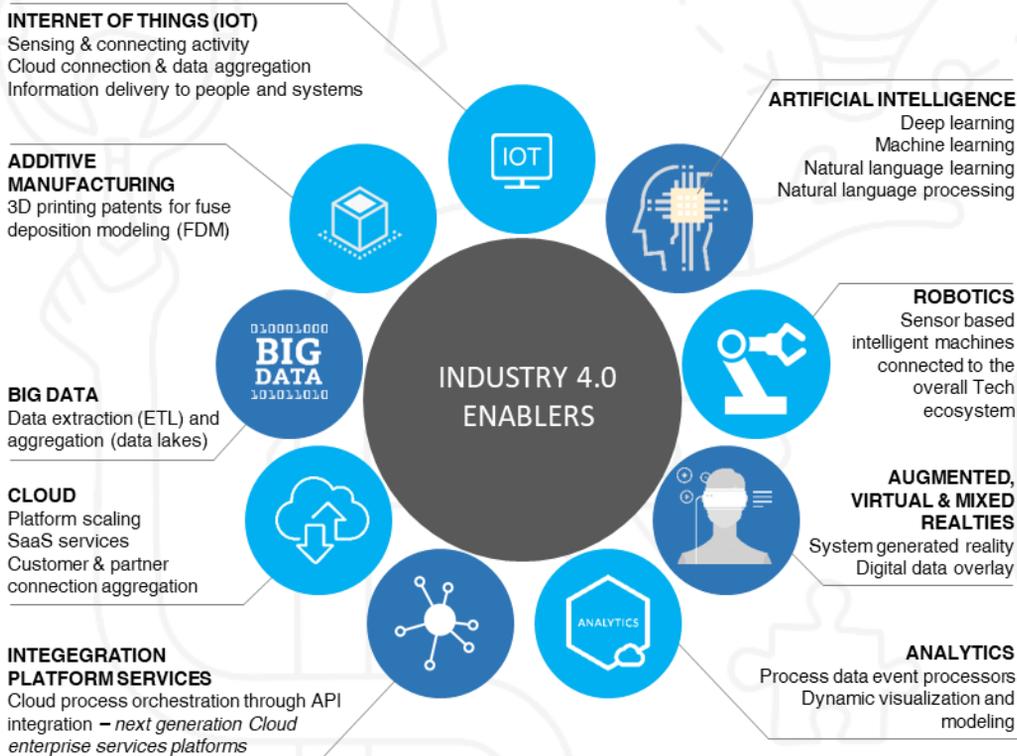
Cyber-physical production systems communicate and cooperate with each other and with humans in real-time. Often through Cloud-based systems, internal and external services that extend beyond the organization's corporate boundaries are used by participants across the manufacturing value chain including customers. These systems enable direct connections to engineering and the plant floor to dynamically address customer demands that have shifted to a "batch size of 1" or mass customized. Customer-specific demands don't only drive production operations and scheduling, they drive decision making in real-time at every point in the manufacturing process: from design, planning, assembly and downward into the supply chain.

Horizontal value chain integration not only enables the creation of new products and services, it creates significant disruption across the entire manufacturing value chain.

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THE 9 PILLARS OF INDUSTRY 4.0

Enabling this industrial revolution are 9 critical technologies:



Each component in an Industry 4.0 technology ecosystem, is interconnected to help drive a high level of precision in process planning and execution. Data and the ability to gain real-time insights derived from the rapid (often in memory) processing of data becomes a valuable decision driver.

However, while technology provides an immense amount of capability to drive real-time connections between people, events and devices, there is little margin for error in defining how these elements should intelligently collaborate in a carefully orchestrated ecosystem. While each element has specific management controls and safeguards, creating an efficiently running ecosystem often requires upfront planning, design, simulation and step-by-step production migration.

Companies who have successfully implemented various Industry 4.0 components often site upfront planning as a critical success factor. They note that while pursuing point solutions initially seemed like the right approach to achieve digital disruption and test the value of minimally valuable products, proper planning could have shortened implementation timelines and overall realization of benefits, thus reducing deployment costs in terms of people and integration efforts.

CANDIDATE SECTORS FOR INDUSTRY 4.0

According to recent studies industries in which the adoption of Industry 4.0 is becoming viable and in many cases vital in order to compete include:

- Telco
- Manufacturing
- Education
- High-tech
- Healthcare & Biotech

Recent studies also show that 32% of all businesses globally have tried elements of Industry 4.0 during 2017 and 69% will have these implemented before 2024.

At the process level, key characteristics that lend these areas to the adoption of one or more elements of Industry 4.0 include but are not limited to:

- Repetitive or rule-based execution,
- Manual intensive,
- Subject to human error,
- Clearly identifiable process efficiency metrics,
- At the intersection of multiple application and data systems,
- Processes are structured, standardized and documented, and
- Ambition to enable customer interactions to set the design, engineering, manufacturing and delivery agenda

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OVERCOMING THE CHALLENGES

Embarking on a digital journey that leverages Industry 4.0 capabilities is not a trivial task. It requires upfront planning, a budget and most importantly, specific skills for designing and implementing digital connections between people, devices and things that drive smart interactions that result in new innovative products and services.

Industry 4.0 strategies enable the achievement of various key business goals, including but not limited to:

- Increased quality of products/services,
- Increased customer satisfaction,
- Increased workforce productivity,
- Increased reliability of operations,
- Increased asset productivity,
- A reduction of material and waste costs,
- Insights on new products/services and cost efficiencies, and
- Access to new markets and customers.

As with other IT-related projects, digital transformation projects also have inherent challenges that should be properly addressed before execution:

1. A digital transformation project is a business project first and a technology project second. **Upfront definition of the business opportunity and expected outcomes** must be defined before investing time & resources into the project,
2. An improperly defined business case for adopting Industry 4.0 capabilities is risky. **The business case not only sets expectation but more importantly it defines and creates visibility as to the level of technical integration** required and how the company's traditional operating processes and structure will be impacted,
3. Lack of experience or knowledge in comprehensive R&D can pose a serious risk to a project's success. Structuring an R&D group that helps define the Industry 4.0 strategy while having the courage to explore and validate new proposed manufacturing models and customer/partner interconnections will also be key. The results and **lessons learned at this stage become valuable input to the business case and ongoing development and integration efforts,**
4. New business solutions are composed of a complex, heterogeneous mix of technologies. **Having the right technical architecture and integration framework is one of the greatest reasons why Industry 4.0 projects fail.** Companies often underestimate integration complexity and the need for a formal services architecture to enable interconnection between devices, people and things. An M2M strategy alone will not be enough,
5. It is often **difficult to understand, compare & choose products that meet the company's operating needs while ensuring the right integration and connectivity linkages** to interact with customers and suppliers. Digital project requirements vary widely as do digital platform capabilities, and
6. Platform **capabilities augment & often overlap existing capabilities.** Duplicate functionality already deployed elsewhere in a company's application ecosystem will require critical decisions to be made about which source system is used for what functionality and how master data management is executed across systems.

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TURNING CHALLENGES INTO OPPORTUNITIES

While the challenges can appear daunting the benefits and opportunities for the radical rethinking of a company's value chain are significant. These include:

- **Efficient use of labor.** Provide employees with resources and tools that facilitate professional practice, avoid reworking, streamline processes and create visibility in their environment (customers, manufacturing, patients, students, etc.),
- **Efficient use of energy.** On a daily basis, the cost of energy continues to rise which results in external and internal pressure to use renewable technologies and low emissions. This need implies having resources to optimize and make energy use more efficient,
- **Supply chain optimization.** Maximizing transportation management efficiencies, optimizing inventory levels and gaining insight into what happens with products on third party shelves or when received by customers provides invaluable insight to improve product planning and manufacturing processes,
- **Quality and guarantees.** Total quality control and guaranteeing product quality requires a level of traceability that goes from the product's base of raw materials, through manufacturing, and delivery to the end customer. Big data and analytics in an Industry 4.0 technology ecosystem provides the necessary infrastructure to manage large amounts of data especially in a growing mesh of global suppliers and partners, and
- **Customer-focused approach.** A client-centric approach makes the customer a central point in the design of products that can be easily tailored to the customer's specific wants. At the same time customer centricity drives a structuring of key manufacturing processes while delivering a personalized customer interaction that helps ignite new brand connections and loyalty.

HELPING CLIENTS TO ADOPT INDUSTRY 4.0 STRATEGIES

NEORIS detected Industry 4.0 trends a few years ago and has since implemented a number of internal changes to provide our clients with the necessary skills to successfully adapt to this fourth industrial revolution. We help clients define, plan and make their digital aspirations real.

Key client focus areas include:

- Managing Ongoing & New Strategic Projects,
- Establishing a Framework for Our Client's Industry 4.0 Strategy,
- Researching Additional Industry 4.0 Solution Ideas,
- Developing an Initial Strategic Roadmap,
- Developing an Initial Strategy Backlog,
- Developing an Initial Portfolio Plan, and
- Developing Initial Business Case Definitions.

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ABOUT NEORIS

NEORIS is a leading global consultancy that unlocks business potential and drives Digital innovation to unleash significant industry disruption. NEORIS combines its industry knowledge and experience in disruptive technologies to create new interactive customer connections. The company leverages its knowledge of technology, people and design to create unique and innovative solutions that enable companies to deliver new business value to their customers. Headquartered in Miami, FL., NEORIS has a network of global delivery centers, design studios and operations in the U.S., Europe, Latin America, Africa, the Middle East and Asia.

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