The Four Core Principles of Industry 4.0

According to several thought leaders, we are living within the Fourth Industrial Revolution. In a relatively short period of time for our history, we have moved from steam power, through mass production to automation, and now, a world of cyber-physical interconnected systems. Each of these key industrial milestones have played a huge role in driving manufacturing efficacy. The marketing promises made by many I4.0 vendors, have sparked industrial interest to say the least, whilst many industries have quickly embraced the approach despite the inherent challenges. This we can all agree. However, the question I receive is always the same: What is Industry 4.0 (I will now refer to it as I4.0)? I set a task to answer this question by reinforcing the four core principles that sustain I4.0.

I4.0 is all about cyber-physical systems that drive the Internet of Things

To start, I4.0 is a business trend that combines automation and data exchange, to enhance production quality and improve customer service, with a target of less spending. In its simplest form, I4.0 is all about cyber-physical systems that drive the Internet of Things, within a cognitive, cloud-based computing context. This concept has fueled the conceptualization and execution of smart factories, sparked the formation of information gateways and transformed major academic curriculums around the world.

When the above components are correctly orchestrated within the right context, industrial players can expect high quality production output, due to quick decision-making, agile change and effective process communication. Consequently, the supply value chain improves, which enhances EBITDA performance.

The question is easily answered if you understand the four core principles

This typically generates a new question: How can I quickly validate that my projects are correctly mapped to an I4.0 journey? This question is easily answered if you understand the four core principles that sustain the foundation of I4.0. These four core principles are:

1 Interconnection

Industry 4.0 requires homogenous communication. Interactions are required between minds and machines. This involves the exchange of information down to the sub-tier components like sensorial instrumentation. The IoT is leveraged in order to initiate and manage motion. Robots can now be fully controlled by an individual or a system, as they execute a mini or full production process.

2 Information transparency

This is best explained by exposing the concept of a digital twin. In this aspect the replica of physical asset or process comes into play. Multi-variable virtual data is created and consumed, which mimics the physical behavior of an asset or process. Contextualization of historical and semi-real time data occurs, which is leveraged to optimize performance.

3 Technical assistance

This is where intelligent systems (software or hardware based) help the human operator. Aid comes in the form of operations simplification. For example, managing a process via exceptions, or filtering a world of data to only receive key action insights. Cyber-physical systems should handle the mundane and dangerous tasks that compromise the safety, security and productivity of human labor.

"If you understand the principles, you understand I4.0"

4 Decentralized decisions

This is the epitome of an advanced system. In this context, robots, automated production lines or other cyber-physical systems become hierarchical action agents, within a well or loosely defined action ecosystem. The decision process within this ecosystem is based on tiers, where a lower tier action is decentralized in order to drive an agile action. Action agents are allowed autonomy to execute a task. Action agents now execute a function and can learn continuously to improve performance and productivity with reduced human supervision. Flawless work is executed, which increases process accuracy and productivity.

If you understand the principles, you understand I4.0

Knowing if your projects are correctly mapped to an I4.0 journey depends upon how closely you have linked your project to the four core principles summarized above. If you understand the principles, you understand I4.0. I hope this helps to answer some of your fundamental questions as you begin or fine-tune your I4.0 journey.

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