

Industrie 4.0 by Siemens: Steps Made Today

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ABSTRACT

The digital disruption is to transform all industries, leading to new business models based on the new technologies. In manufacturing, one model for digital disruption is Industrie 4.0. Proposals for Industrie 4.0 involve the virtualization and vertical and horizontal integration of the value chain, digital services, the digital transformation of products, the digital transformation of production equipment, the digital transformation of factories and the digital transformation of supply chains. The former two are already in place today. This article and its follow-up builds an overview of the pillars of Industrie 4.0 as addressed by the proponents of the model, by consultancy companies, by journal research, and by the customer proposition of Siemens. CapGemini rate General Electric as a key player in the Industrial Internet in the Digital Revolution, and Siemens is its contestant. This article builds a detailed analysis of Siemens' strategy which covers the steps already made and the steps to be made in the future as a follow-up. The digital twin strategy leads the way to the next stage.

KEYWORDS

Big Data Analytics, Digital Thread, Digital Twin, Horizontal Integration, Industrie 4.0, Internet of Services, Internet of Things, Product Lifecycle Management, Vertical Integration, Virtualization

INTRODUCTION

Information technology, in the form of IDC's third platform, is on its way to disrupt all industries with new business models. These technologies are cloud, big data analytics, social business and mobility and technology accelerators. Mobility and technology accelerators consist of robotics, natural interfaces, 3D printing, Internet of Things, cognitive systems, next generation security. The Internet of Things and the Internet of Services are about to disrupt manufacturing industries. Industrie 4.0 is a proposal to address this issue. Industrie 4.0 is a business model in a vertically integrated and end-to-end engineered lifecycle and horizontally integrated supply chain. Cyber-physical products and cyber-physical systems negotiate production scheduling across the Internet of Things and form smart factories. The Internet of services is used to offer participants to the value chain internal and cross-organizational. Industrie 4.0 was made as a proposal in 2013, referring to possible future technology and business models designed to make manufacturing in high-cost countries competitive and profitable. A similar project in USA is the Industrial Internet.

Capgemini (2014, p. 74) finds that General Electric is one of the major players in the Industrial Internet, whereas Siemens is recognized by Wall Street Journal (2017), The Economist (2016) as General Electric's challenger. This article is a case study for Siemens' strategy for Industrie 4.0. The ground for this research is that Siemens, as a leading solution provider to manufacturing industries and an Industrie 4.0 adept, will create their technologies and thereby capabilities and will support

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their business models. The goal of this research is to expound Siemens' customer value proposition and the product, service and solution offerings that underpin it and compare it to mainstream literature about the Industrie 4.0 technologies, capabilities and business models. It involves the literature review about Industrie 4.0 according to the main consultancy bodies that provide the vision and to technology journals that provide the details of the current technology progress to the vision and research and development needs.

This article will provide the highlights of the vision and research in technology journals, not an exhaustive view. Data about Siemens is gathered via Siemens' communications in annual reports, the Siemens Website, Siemens The Magazine, Siemens Pictures of the Future, Siemens press releases, searches via key word about Siemens. This body of data is explored, and patterns are induced; the findings are expounded, analyzed and critiqued in a strategic management approach.

BACKGROUND

International Data Corporation IDC (2016) presents a set of information technologies that it predicts will change technology in all industries by 2020: cloud, big data analytics, social business and mobility and technology accelerators (robotics, natural interfaces, 3D printing, Internet of Things, cognitive systems, next generation security). IDC predicts these technologies will lead to the Digital Economy, and that the transition is the innovation stage. According to IDC, this technology triggers digital transformation. Digital transformation will consist of "...new business models, products and services that seamlessly blend digital and physical altering business and customer experiences and generating additional revenue streams..." According to MIT Center for Digital Business (2010), information technology is driving innovation in several ways and leads to the transformation towards the Digital Economy. The report *Digital Transformation: A Roadmap for Billion-Dollar Organizations at CapGemini* (MIT Center for Digital Business, 2011; CapGemini, 2011) is assessed by Whitespace as one of the top five thought-leadership pieces. The World Economic Forum calls this the Fourth Industrial revolution and points to mass adoption of digital technologies but by innovations in everything (World Economic Forum, 2016a, 2016b). The Global Center for Digital Business Transformation (2016a, 2016b) identifies and defines digital business transformation as "...organizational change through the use of digital technologies and business models to improve performance..." According to the center (The Global Center for Digital Business Transformation, 2016c), digital transformation will impact all industries and create a digital vortex. Accenture's Forrester Study (McQuivey, 2013; Accenture, 2016a) similarly identifies a digital vortex that will transform industries differently. Harvard Business Review (Kavadias, Ladas & Loch, 2016) speak about how digitalization is about to transform the economy by generating new business models based on this technology, and that business models generate the transformation. As part of the digital disruption forecast for all industries, consultants such as Mc Kinsey (2015a, 2015b, 2016), Price Waterhouse Coopers (2016), Cisco (2014), IBM (2016), Accenture (2016a), KPMG (2015), CapGemini Consulting (2016), The World Economic Forum (2016a, 2016b), tackle Industrie 4.0 and the Industrial Internet as proposals.

Industrie 4.0 is a proposal for manufacturing based on cyber-physical systems which negotiate decisions as peers across the Internet of Things. The convergence of the physical and the virtual world (Kagermann, 2013, pp. 15) is quintessential to Industrie 4.0 and enabled by cyber-physical systems. Cyber-physical systems are defined as "...orchestrations of computers and physical systems..." where "...embedded computers control physical processes, usually with feed-back loops..." and "...physical processes affect computations and vice-versa..." (Lee, 2012; Lee, 2017). According to Toro, Barandiaran, & Posada (2015), cyber-physical systems are "...systems of collaborating computational entities which are in intensive connection with the surrounding physical world and its ongoing processes, providing and using, at the same time, data accessing and data processing services available on the Internet..." This article uses the "five C" architecture for cyber-physical

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