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Industrie 4.0 Strategy

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Industrie 4.0 is the current trend of automation and data exchange in manufacturing technologies. Industrie 4.0 creates what has been called a "smart factory". Within the modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. The automation technology is improved by the introduction of methods of self-optimization, self-configuration, self-diagnosis, cognition and intelligent support of workers in their increasingly complex work.

There are 4 design principles in Industrie 4.0: interoperability (the ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of Things or the Internet of People); information transparency: (the ability of information systems to create a virtual copy of the physical world by enriching digital plant models with sensor data); technical assistance (the ability of assistance systems to support humans by aggregating and visualizing information and the ability of cyber physical systems to physically support humans by conducting a range of tasks); decentralized decisions (the ability of cyber physical systems to make decisions on their own and to perform their tasks as autonomously as possible) [1].

The transformation of the economy being brought about by Industrie 4.0 means that, in the future, business processes such as supply, manufacturing, maintenance, delivery and

customer service will all be connected via the Internet. In markets where the benefits of a digital good increase in proportion to the number of users, global market leadership can only be achieved through rapid and widespread global expansion. Platform-based software markets in particular are frequently characterized by network effects. Direct network effects occur in these "winner takes all" markets when the benefits to existing users increase as the number of new users grows. Indirect network effects are generated through the growing number of complementary products based on the central platform provider's de facto standard.

The standardization of architectures, data exchange formats, semantics, vocabularies, taxonomies, ontologies and interfaces is key to creating interoperability between the different technologies involved in a complex and extremely heterogeneous field like Industrie 4.0 [2]. There is no focus on any one particular standard because of Industrie 4.0 complexity.

In view of the race that is currently underway to establish international norms and standards as quickly as possible, many of the experts believe that standardization work is currently progressing too slowly [1]. However, they also stressed the fact that the highly complex nature of Industry 4.0 and the need for extensive committee work have a strong impact on the speed at which standardization progresses. The experts feel that closer international cooperation between companies, associations and policymakers is required in order to give current standardization activities greater impetus.

Standardization is an essential requirement for combining different systems. Different components can only work together (interoperability) or be used on other systems (portability) if cross-manufacturer standards are established for the design of technical IT infrastructures. The key factors that influence the standardization process include the stakeholders'

general interest in establishing standards and their preference for one particular standard or another. Closed standards can be more precisely controlled as the technology continues to develop and promise higher returns for the suppliers of technology products. Open standards can be more rapidly and widely established, although it is harder to use them for commercial gain.

The international competition with regard to the establishment of norms and standards for Industrie 4.0 means that close cooperation is required between businesses and institutions [3]. The experts identify different ways of cooperating in order to drive norms and standardization and develop innovative Industrie 4.0 solutions in these areas: industry-specific and cross-industry cooperation, cooperation with suppliers and with competitors and cooperation with global corporations and innovative start-ups.

In June 2013, consultancy firm McKinsey released an interview featuring an expert discussion between executives at Robert Bosch - Siegfried Dais (Partner of the Robert Bosch Industrietreuhand KG) and Heinz Derenbach (CEO of Bosch Software Innovations GmbH) - and McKinsey experts [3]. This interview addressed the prevalence of the Internet of Things in manufacturing and the consequent technology-driven changes which promise to trigger a new industrial revolution which is referred to as Industrie 4.0. Some examples for Industrie 4.0 are machines which can predict failures and trigger maintenance processes autonomously or self-organized logistics which react to unexpected changes in production.

According to Dais, "it is highly likely that the world of production will become more and more networked until everything is interlinked with everything else" [1]. While this sounds like a fair assumption and the driving force behind the Internet of Things, it also means that the complexity of production and supplier networks will grow enormously.

Networks and processes have so far been limited to one factory. But in an Industrie 4.0 scenario, these boundaries of individual factories will most likely no longer exist. Instead, they will be lifted in order to interconnect multiple factories or even geographical regions.

There are differences between a typical traditional factory and an Industrie 4.0 factory. In the current industry environment, providing high-end quality service or product various data sources are available to provide worthwhile information about different aspects of the factory. In contrast, in an Industrie 4.0 factory, in addition to condition monitoring and fault diagnosis, components and systems are able to gain self-awareness and self-predictiveness, which will provide management with more insight on the status of the factory [4].

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