#SMARTer2030

ICT Solutions for 21st Century Challenges

GeSI
GLOBAL e-SUSTAINABILITY INITIATIVE

accenture strategy

3.8 Manufacturing – Resource efficient and customer centric

Smart Manufacturing – The Context

Recent technological developments in the scope of the *Internet of Things* and *Machine-to-Machine* connectivity have been described as a "Fourth Industrial Revolution". This is by no means an exaggeration.

By 2030, the 4th industrial revolution, also known as the 'Industrial Internet of Things' will transform traditional factories into high performance, fully optimized plants.

This revolution, is enabled by Cyber-Physical Systems, also known as "Industry 4.0" or as "*The Industrial Internet of Things* (IOT). The IOT is made up of a combination devices connected to each other via the cloud, in the context of manufacturing this would be a combination of Smart Machines, Smart Materials and Smart Products, all of which are interconnected and generate continuous data that is collected, processed and analyzed in a central location. Making optimal use of this generated data can help traditional factories increase in productivity, quality, and production flexibility, while reducing their environmental footprint, energy and other resource usage.

Although the benefits of ICT powered manufacturing are widely accepted, the most recent technological developments are far from mainstream. A recent Accenture survey in this area showed that a little over a third of companies currently apply automation technology. This points to the current low rate of ICT adoption among manufacturers. Several technological barriers must be overcome before a truly smart manufacturing operation can be realized.

When organizations manage to overcome these barriers, ICT powered Smart Manufacturing can enable innovations like virtual manufacturing, customer-centric production, 3D printing and virtual production networks, and circular supply chains for resource efficiency to become commonplace.

What is Smart Manufacturing?

Smart Manufacturing is the application of advanced communications systems to conventional manufacturing processes, making them more flexible, efficient and responsive. There is a range of options available to manufacturers to radically overhaul their current model by making it much more responsive to individual customer needs on the one hand and resource efficient on the other. Making our manufacturing "smart" effectively transforms factories from traditional cost centers into high-performance plants, fully optimized in their use of direct material inputs as well as their use of energy and water.

Smart Manufacturing can be defined as "the intensified application of advanced intelligence systems" that create a fully digital value chain.

Gartner and Accenture Strategy research suggests a timeline of 5 to 10 years for Smart Manufacturing to become fully integrated across operations and industries. Data analytics and cloud computing, on the other hand, are already commercialized.

More complex applications, like 3D printing, drones and robotics and augmented reality devices, could take more than a decade to become commercially viable to all.

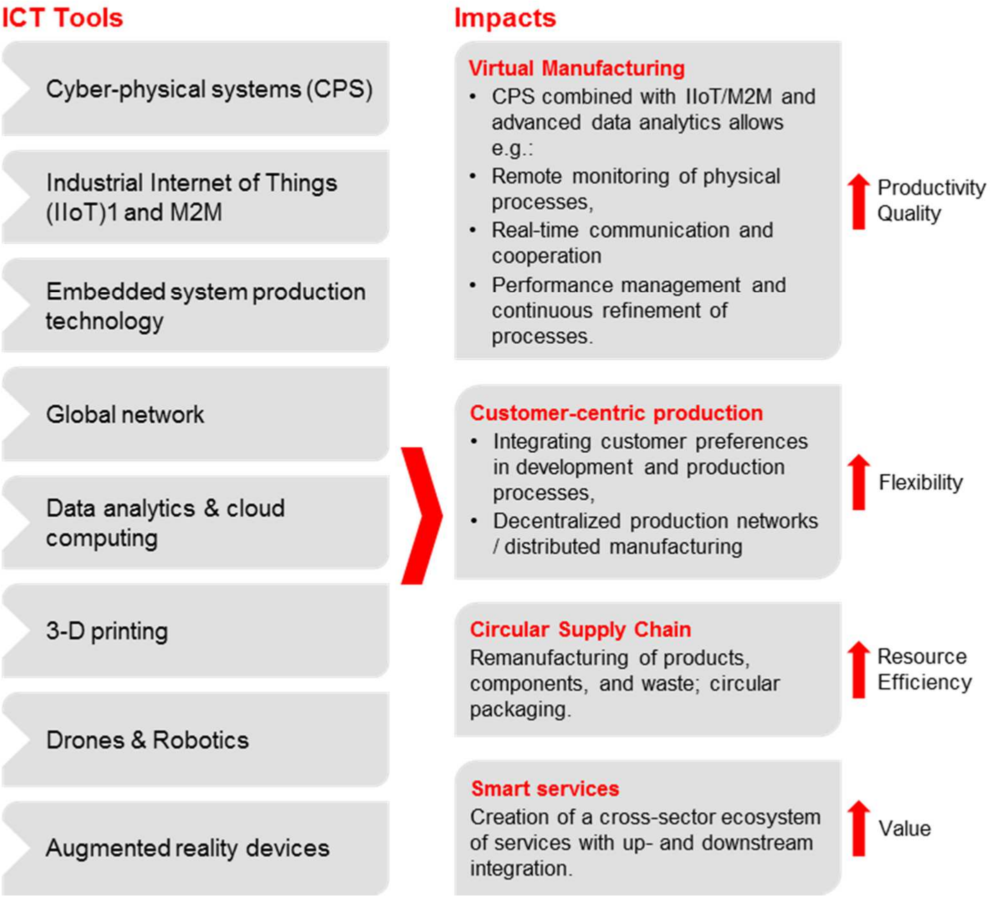
Future of Smart Manufacturing

Smart devices have the potential to transform how factories operate, how sites are managed, how vehicles are maintained and operated, and much more. As industrial devices become more intelligent and connected, they produce huge amounts of data that can be collected and used to generate new business ideas and drive new, digital value chains.[1]

Smart Manufacturing comprises multiple key disruptive technologies, enhancing operational excellence, resource efficiency and time to market.

The future of manufacturing will see a central role for ICT enabled factories that are self-organized, flexible, decentralized and highly connected.

Figure 1: Manufacturing - Future of Smart Manufacturing: Technology Vision for 2030



Virtual Manufacturing

By 2030, we envision the potential roll-out of what some have called virtual manufacturing in which elements of the following capabilities become commercially viable at scale.

CPS-optimized production processes: Smart factory "units" will be able to determine and identify their own fields of activity, configuration options and production conditions as well as being able to communicate independently with other units.

Self-organizing and self-maintaining factories: Smart machines will be able to detect when they are faulty, switch production lines and repair themselves without any downtime.

[1] Digital Factory (2014), 4.0 The digital industry: a case study for an industrial revolution

Flexible factories and products: Fully ICT-enabled factories will have dynamic production lines, through which products can move autonomously through the CPS-enabled workstations based on customer needs. This will allow for fast and efficient customized production processes and could even enable virtual production networks, where businesses can send their product design to any factory across the globe and have their product 3D printed or produced instantly.

Customer Centric Production

Smart manufacturing lends a further boost to the empowerment of the customer to affordably tailor mass produced items to specific needs. It also allows wholesale customers to monitor and track all stages of their order in real-time, enabling them to better optimize their own supply chain planning and requirements.

Circular Supply Chain

Smart manufacturing can also contribute to the roll-out and viability of circular business models by allowing products and components to be tagged, tracked and traced throughout their entire lifecycle. In a circular model, products are returned to the factory at end-of-life to be re-manufactured, repaired or refurbished, creating significant resource savings. This enables companies to reduce their input costs, manage supply chain risks and become more competitive in their sectors[2].

Smart Services

Already today, we are witnessing a shift towards service offerings even in product-focused sectors like manufacturing. Offering products as services can open up new market segments, generate revenue opportunities and create competitive advantage.

Our research predicts that by 2030 we will see the development of cross-sector ecosystems of services with up and downstream integration, where products can be produced on-demand at any place or time, facilitating immediate responses to changes in market conditions.

Sustainability Impacts of Smart Manufacturing

Smart Manufacturing contributes 22% (2.7Gt CO_{2e}) of the total emissions abatement potential of the eight sectors covered in this report, with the aim of creating a total abatement potential of 12.08 Gt CO_{2e} by 2030. In addition, smart manufacturing solutions have the potential to create energy savings of 4.2 billion MWh and save 81 billion liters of water through more efficient production processes.

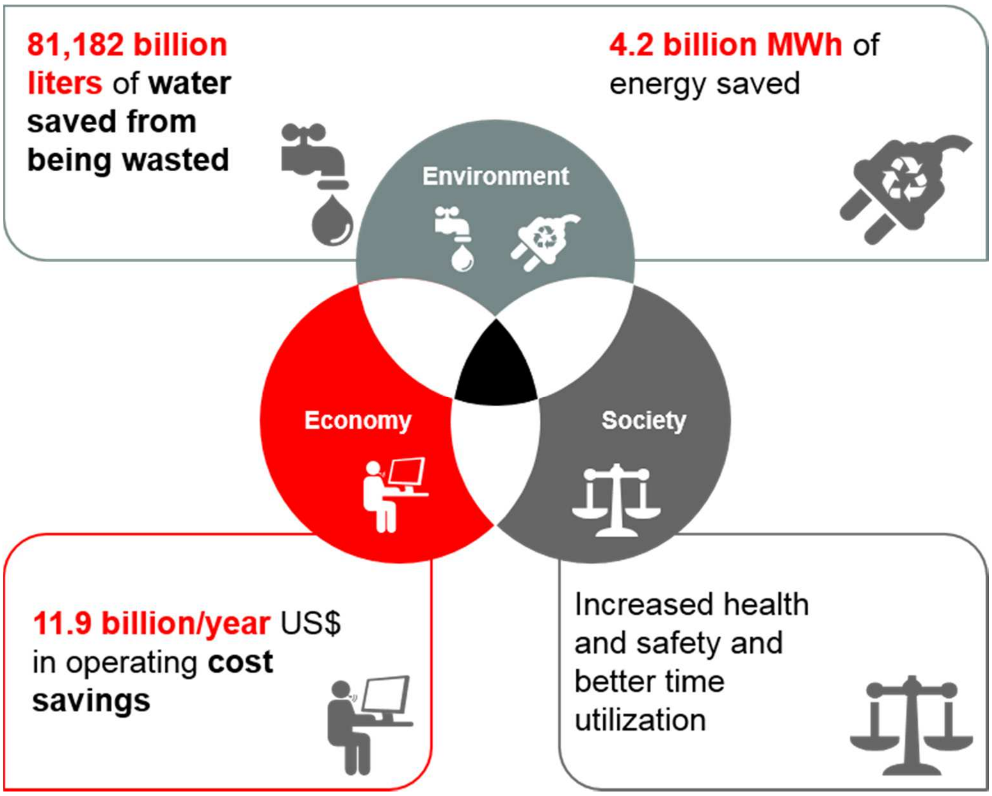
The global emissions abatement potential from Smart Manufacturing equals 22% of the total contribution from the eight sectors.

Smart manufacturing solutions also create significant economic benefits. We estimate that the introduction of automated and self-maintained smart processes will lead to industry cost savings of $349 billion.

Smart Manufacturing helps improve production costs and quality, while minimizing environmental impact, natural resource use, and energy consumption.

[2] Accenture (2014), *Circular Advantage - Innovative Business Models and Technologies to Create Value in a World without Limits to Growth*

Figure 2: Manufacturing - Benefits of Smart Manufacturing



FJVPS – Avoiding emissions in manufacturing through digital prototyping

The Fujitsu Virtual Product Simulator (FJVPS) is an advanced manufacturing industry solution that allows manufacturing companies to create virtual prototypes of their products, machines or other items instead of having to physically manufacture them. The FJVPS provides a simple design operation using 3D-CAD data that even people inexperienced with the technology can use to design their own prototypes, detect faults and improve design quality in the very early stages of product design.

The Virtual Product Simulator realizes benefits such as quality improvement by detecting 50-80% of design errors, shortening the development period and associated costs by 50%, and reducing necessary man-hours by 30-40%. Furthermore, replacing face-to-face with online meetings, and reducing resources used for prototyping, achieves a reduction in CO_{2e} emissions of 30%. Allowing companies to virtually test their design without physical manufacturing drives significant savings in terms of time, money, resources and emissions.

Smart inverters – Enabling solar power plants

Solar energy is one of the most promising renewable energy sources to date. Solar cells and panels used to generate this energy are produced in Photovoltaic (PV) plants. Inverters are the core of every PV plant, converting direct current generated through PV modules into energy usable in the grid. In addition, inverters control and monitor the plant and grid to ensure optimum safety. Chinese ICT company Huawei developed a smart PV solution at a 7.8MW solar park in Germany using smart string inverters rather than traditional inverters. These smart inverters are connected via a 4G LTE wireless network, have a smart and readable battery and offer remote monitoring capabilities allowing for better data analysis and a higher power ratio.

Using ICT-enabled inverters allows site owners to have greater control and monitoring of their plant through data collection and analysis, while the price of smart string inverters is lower than that of traditional ones. In addition, this technology improves solar power generation performance in difficult weather conditions such as extreme heat, continuous rain and even in salt mist conditions. Applying this ICT-enabled solution generated the PV plant in Germany a 5% higher yield and a 50% better maintenance efficiency. Smart inverters provide a strong example of how combining advanced hardware and technology with ICT-enabled solutions can enable further integration of renewable energy into the grid.

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About GeSI

The Global e-Sustainability Initiative (GeSI) is a strategic partnership of Information and Communication Technology (ICT) companies and organizations committed to creating and promoting technologies and practices to foster economic, environmental and social sustainability. Formed in 2001, GeSI's vision is a sustainable world through responsible, ICT-enabled transformation. GeSI fosters global and open cooperation, informs the public of its members' activities to improve their sustainability performance, and promotes innovative technologies for sustainable development. GeSI's membership includes over 30 of the world's leading ICT companies; the organization also collaborates with a range of international stakeholders committed to ICT sustainability objectives. These partnerships include the United Nations Environment Program (UNEP), the United Nations Framework Convention on Climate Change (UNFCCC), the International Telecommunications Union (ITU), and the World Business Council for Sustainable Development (WBCSD). Such collaborations help shape GeSI's global vision on evolution of the ICT sector, and how it can best meet the challenges of sustainable development. For more information, see www.gesi.org.

About Accenture

Accenture plc. („Accenture'') is a global management consulting, technology services and outsourcing company, with more than 323,000 people serving clients in more than 120 countries. Combining unparalleled experience, comprehensive capabilities across all industries and business functions, and extensive research on the world's most successful companies, Accenture collaborates with clients to help them become high-performance businesses and governments. The company generated net revenues of US$30.0 billion for the fiscal year ended August 31, 2014. Its home page is www.accenture.com.

About Accenture Strategy

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