The Fourth Industrial Revolution: Opportunities and Challenges for Smart Manufacturing

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The 4th Industrial Revolution (4IR)

- Set of highly disruptive technologies like artificial intelligence, robotics, blockchain and 3D printing
- Changes are revolutionary not only due to the breadth of the sectors impacted, but also due to the speed
- 4IR is transforming social, economic, and political systems in often unpredictable ways
- Almost every aspect of our lives will be touched: jobs, business models, industrial structures, social interactions, systems of governance

Broad Economic Implications

- **On economic growth**
  - 4IR creates opportunities for countries to bypass traditional phases of industrial development (technological leapfrogging).
  - New technologies have already brought well-documented improvements to productivity, profitability, and sustainability in agriculture, manufacturing, and services.
  - Increased productivity from “disruptive technologies” could unleash an additional US$220 billion to US$625 billion in annual economic impact in ASEAN by 2030 (ASEAN Secretariat, 2016).

Broad Economic Implications

- **On consumer and social welfare**
  - 4IR will expand consumer choice, lower costs, and raise the quality of products and services.
  - 4IR will also create new ways for citizens to connect to each other, to trade with each other, and to access services that are currently not available.
  - But greater reliance on digital and online services also brings challenges related to personal and sensitive information. Issues of security, privacy and intellectual property rights are of paramount concern.

Broad Economic Implications

- On enterprises, particularly MSMEs
  - 4IR can be particularly useful in empowering MSMEs, which make up the bulk of enterprises and employment in developing countries.
  - Digital technologies and online services can significantly lower the costs faced by enterprises, allowing them to participate in regional and global trade, thereby increasing the inclusiveness of growth.

Broad Economic Implications

- On enterprises, particularly MSMEs
  - MSMEs are often constrained by lack of access to business and financial services.
  - Blockchain technology has the potential to dramatically increase the security of cross-border financial transactions and logistics, even in countries where these services are relatively underdeveloped.
  - This technology has the potential to benefit the smallest firms in the poorest countries.

Broad Economic Implications

- **On employment**
  - 4IR can create new employment opportunities in emerging tech industries and services. But increased reliance on AI and robotics could also threaten jobs.
  - The immediate threats are to low-skilled, repetitive jobs (such as assembly line workers), but people will still need to man the process.
  - Services jobs are also at risk, and could increase over time.

4IR and the Future of Manufacturing

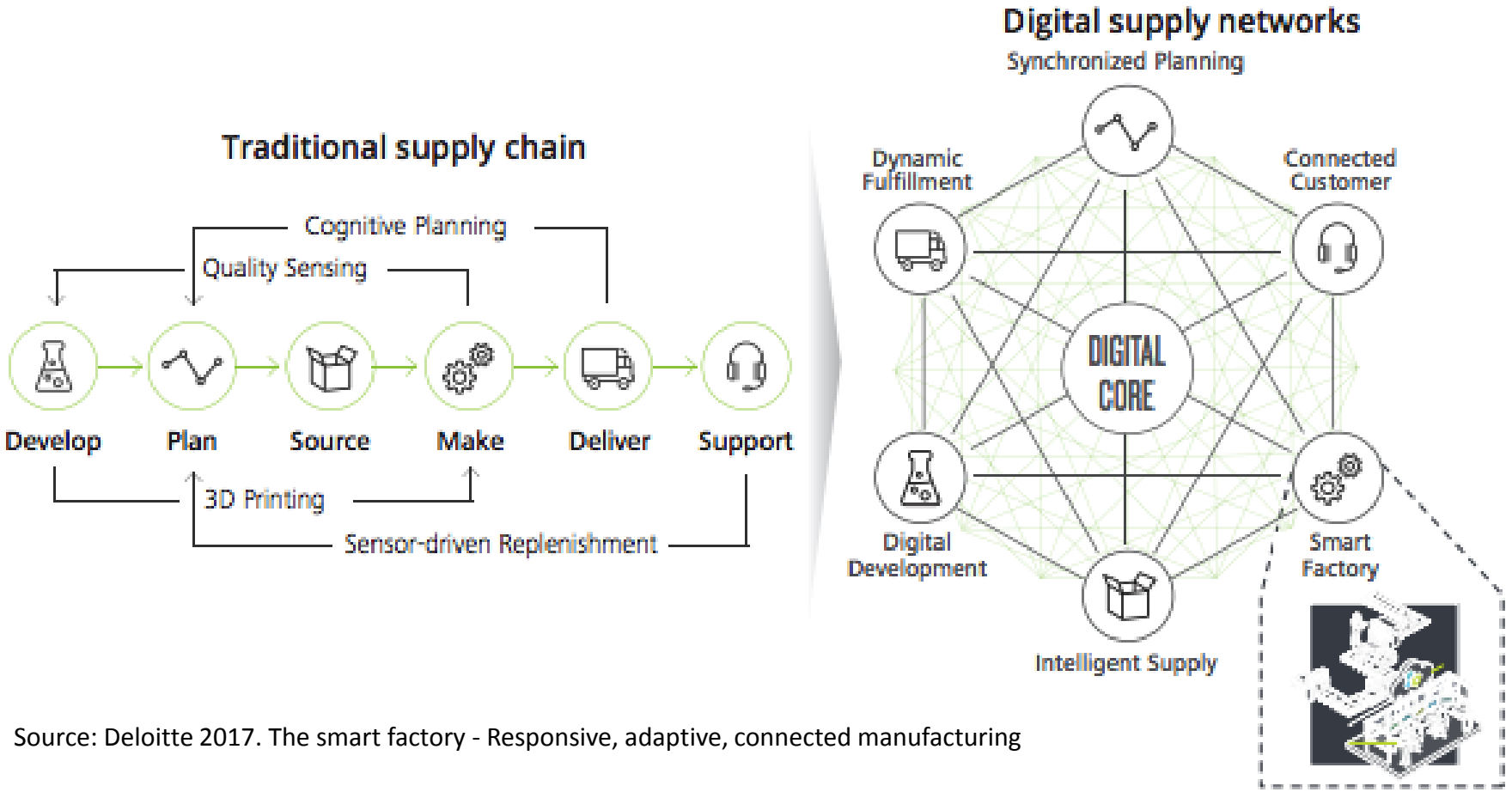
- There is increasing pressure for greater efficiency and productivity of factor inputs, driven by the need to produce goods at the lowest possible price while meeting consumer demand.
- The constant need to reduce cost and the growing desire for more on-demand production will increase the demands on the manufacturing industry.
- 4IR provides opportunities for the industry to meet these demands, by offering greater efficiency, agility, as well as safety.

4IR and the Future of Manufacturing

- Manufacturing has traditionally been equated with factory production using large machinery and an ample workforce for economies of scale.
- With additive manufacturing processes such as 3D printing, many goods are now made at centralized locations operating at scale and producing standardized products.
- In future, long and complex supply chains will no longer be necessary as the entire products can be built from scratch without the assembly of different components.

Sources: ADB. 2013. Beyond Factory Asia: Fuelling Growth in a Changing World.

Menon, J.and A. Fink. 2018. The Fourth Industrial Revolution and its Implications for Regional Economic Integration in ASEAN Working Papers in Trade and Development No. 2018/04. Arndt-Corden Department of Economics Crawford School of Public Policy ANU College of Asia and the Pacific



Source: Deloitte 2017. The smart factory - Responsive, adaptive, connected manufacturing

Changing Supply Chains

In addition, many supply chains are transforming from the traditional linear and static sequence to a dynamic, interconnected system.

5 Characteristics of a Smart Factory

Connected	Optimized	Transparent	Proactive	Agile
• Continuously pull traditional datasets along with new sensor and location-based datasets • Real-time data-enabling collaboration with suppliers and customers • Collaboration across departments	• Reliable, predictable production capacity • Increased asset uptime and production efficiency • Highly automated production and material handling with minimal human interaction • Minimized cost of quality and production	• Live metrics and tools to support quick and consistent decision making • Real-time linkages to customer demand forecasts • Transparent customer order tracking	• Predictive anomaly identification and resolution • Automated restocking and replenishment • Early identification of supplier quality issues • Real-time safety monitoring	• Flexible and adaptable scheduling and changeovers • Implementation of product changes to see impact in real time • Configurable factory layouts and equipment

Source: Deloitte 2017. The smart factory - Responsive, adaptive, connected manufacturing

Who's ready to reap the benefits?

Research by Capgemini estimates that smart factories could add between $500 billion to $1.5 trillion in value added to the global economy in five years.

However, a recent study by the World Economic Forum reveals that only 25 countries are in the best position to gain from this transformation. These countries are concentrated in Europe, North America, and East and Southeast Asia.

Sources: Capgemini. 2017. Smart Factories and the Modern Manufacturer.

WEO. 2018. Readiness for the Future of Production Report 2018.

- The 25 countries in alphabetical order are: Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Israel, Italy, Japan, Republic of Korea, Malaysia, Netherlands, Poland, PRC, Singapore, Slovenia, Spain, Sweden, Switzerland, United Kingdom and United States.

Preparing for the Future

- 4IR's transformative impact behoove countries to think about their policies and priorities. Many Asian governments are aware of this need and have launched national responses, such as Thailand 4.0, Singapore's Smart Nation initiative, and Malaysia's National Industry 4.0 Policy Framework to be launched this year.
- The more developed countries are better prepared to deal with the challenges and take advantage of the opportunities introduced by 4IR.
- The poorer countries need to catch up with preparedness to avoid falling further behind.

Preparing for the Future

- **Investing in infrastructure**
  - Investments in both ICT infrastructure will be critical to provide the backbone for technical innovation.
  - These investments are also necessary to bridge the technological divide that remains both between and within countries.

Preparing for the Future

- **Investing in technology**
  - Businesses need to accelerate efforts to implement digital, automated, and connected processes and services.
  - Many firms in developing countries still employ processes and systems that are out of date and difficult to retrofit with new technologies; entire production systems will have to be upgraded (OECD, 2017).

Reference: OECD. 2017. Opportunities and Policy Challenges of Digitalisation in Southeast Asia. Background note for the OECD Southeast Asia Regional Forum. 24 August 2017, Bangkok, Thailand

Preparing for the Future

- **Supporting enterprises, particularly MSMEs**
  - The costs associated with adopting new technologies can become a barrier to the development of smart manufacturing.
  - Bigger manufacturing firms have the option to tap FDI and capital markets to accelerate technology innovation, but MSMEs may require some form of government support.

Preparing for the Future

- **Investing in human capital**
  - Reskilling work forces will require a transformation in education. Governments must pursue education reform and promote lifelong learning.
  - Augmenting cognitive skills such as maths and sciences will be critical for the transition to a more innovative, knowledge-based economy.
  - There will also be a need to strengthen regional education networks and connect innovation incubators across the region.

Preparing for the Future

- **Allowing for greater labor mobility**
  - Labor flows can help address short-term skills gaps, but APEC countries have yet to fully address issues of labor mobility.
  - ASEAN countries have signed a number of MRAs for skilled jobs, but implementation has been stymied by domestic rules and regulations on employment and licensing requirements.
  - The challenge continues to be overcoming the various political and social barriers that stand in the way of greater labor mobility.

Preparing for the Future

- **Strengthening collaboration**
  - Preparing for 4IR requires a combination of national, regional, and solutions. Regional and global cooperation is particularly critical in developing and harmonizing standards and regulations.
  - New and innovative approaches to public-private collaboration are also needed, particularly in areas such as infrastructure development and R&D.

The Bottomline

- The impact of 4IR will be extremely hard to predict. Much depends on whether the right policies and institutions are in place.
- There are challenges to be met, but also opportunities to be exploited.
- Policymakers at both national, regional, and global levels will need to start refashioning their institutions and policies, and they need to do so quickly.