

Industry 4.0: The Industrial Revolution in Manufacturing Industry



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With the fast development of Internet of Things (IoT) and the wave of smart manufacturing services, the German industry has clearly realised that future production methods will be smarter and become a standard which every country will refer to.

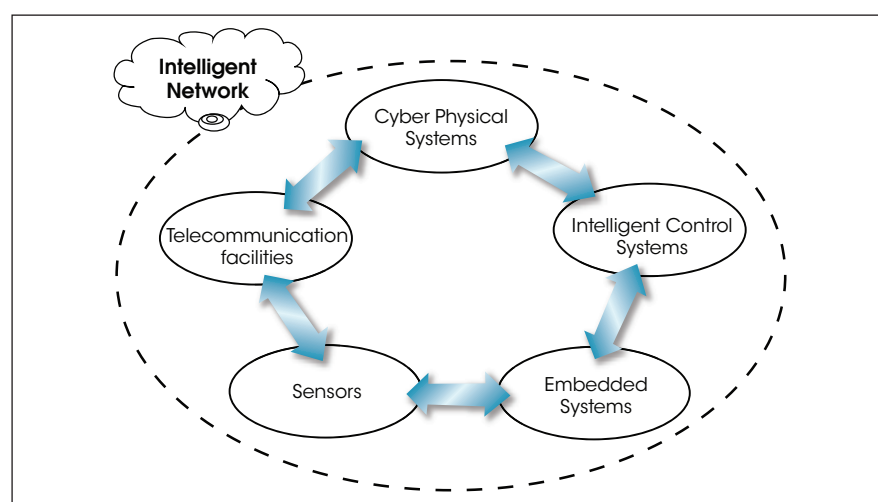


Figure 1: Intelligent networking

machine and product. In principle, the intelligent network will cover cyber physical systems, communication facilities, intelligent control systems, sensors and embedded systems (see Figure 1).

Industry 4.0 will integrate IoT and services network into industry systems completely. In addition, the traditional production model will be transformed into highly customisable, intelligent and service oriented model.

In future, CPS will link human, machines and information. Industry 4.0 is the era of intelligent manufacturing. Physical and digital worlds will be integrated to become CPS. Traditional manufacturing will transform into services oriented manufacturing, and hybrid products will be manufactured to meet the needs of different customers.

Smart manufacturing is a complex engineering system such as manufacturing execution system (MES), CPS, robotic systems and highly intelligent manufacturing control systems. Figure 2 shows the smart manufacturing systems.

For the 4th Industrial Revolution (also commonly known as Industry 4.0) in manufacturing, Cyber Physical System (CPS) will be the main foundation, and this includes intelligent manufacturing, digital factory IoT and Internet of Services, through Information and Communication Technologies (ICT) to achieve integration between virtual technology and machine.

The smart factory will be built to connect the whole value chain of a product. Industry 4.0 will totally change human life. The First Industrial Revolution used water and steam power to mechanise production. The Second used electric power to create mass production. The Third used electronics & information technology to automate production. Now Industry 4.0 is building on the Third, the digital revolution that has been occurring since the middle of the last century.

It is characterised by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.

The core value of Industry 4.0 is the Cyber Physical System which interconnects all components in the supply chain, such as end user, supplier, smart factory, production line,

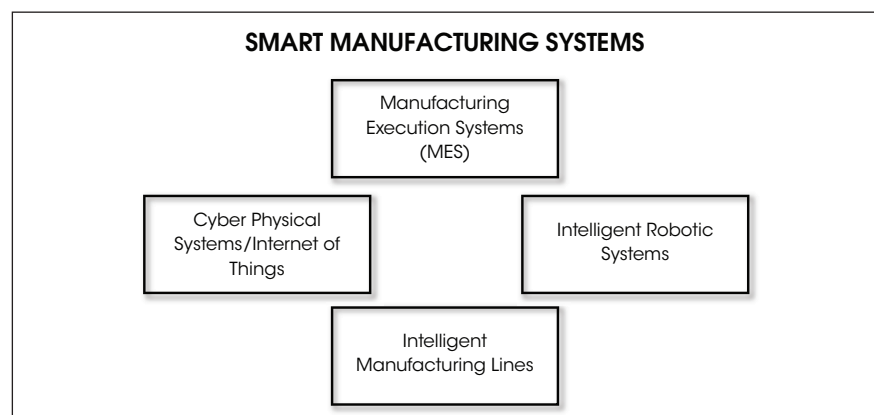


Figure 2: Smart Manufacturing Systems

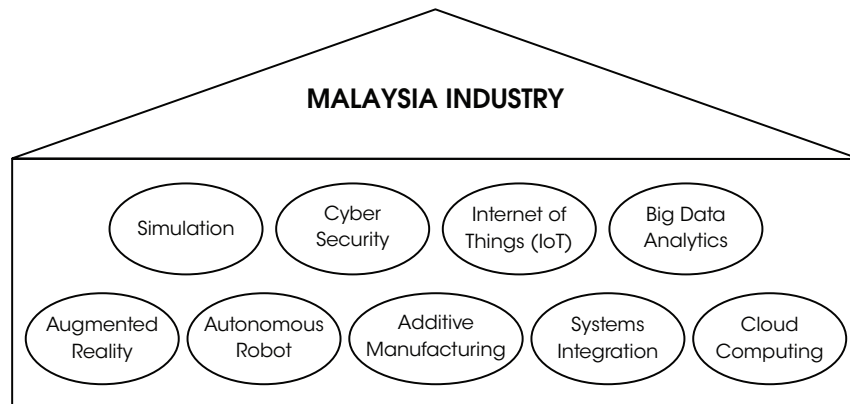


Figure 3: Nine pillars of technology

The business model of Industry 4.0 has features such as integration of cyber and physical manufacturing, manufacturing based on network, an autonomous and adaptable logistics systems that is directly interconnected to IoT and the smart factory. Customers can also participate in full scale production process. The new business model of Industry 4.0 will affect the development of a traditional company. It will also restructure the whole value chain of the business network and impact the traditional company.

There is a 6C system (Cloud, Connection, Cyber, Community, Content and Customisation) related to big data and a 6M system (Material, Method, Machine, Measurement, Model and Maintenance) related to manufacturing. Combining both will enable the smart factory to be realised, integration of horizontal and vertical information as well as a seamless information link between the supply chain and the client.

The 6C Category

1. **Cloud:** Cloud computing and big data analytics will enable rapid response from company.
2. **Connection:** In the age of IoT, everything is interconnected via sensors and networks.
3. **Cyber:** The economies of scale generated in a virtual environment is larger than that of the physical world
4. **Community:** Through social networking and gathering of information from the social network, to predict the future trends.

5. **Content:** With real time and sufficient content as well as more transparent information.

6. **Customisation:** Improved customer satisfaction, flexible manufacturing and shorter production line.

The 6M category:

1. **Material:** Based on Material Requirement Planning (MRP), to minimise material usage during production stage and optimisation based on smart supply chain systems.
2. **Method:** Automate and optimise the process for new products
3. **Machine:** Machine to Machine, connected via IoT, to improve efficiency and reduce time.
4. **Measurement:** implementation of Total Quality Control, for real time quality control.
5. **Model:** Simulation model is generated, which allows optimisation of the production process.

The Malaysian Government has formulated the National Policy on Industry 4.0 Blueprint and The Ministry of International Trade & Industry has proposed the nine technology drivers/pillars for Malaysia as Autonomous Robot, Big Data Analytics, Cloud Computing, Internet of Things, Additive Manufacturing (3D Printing), Systems Integration, Cyber Security, Augmented Reality and Simulation (see Figure 3).

However, most small and medium industries generally hesitate to adopting Industry 4.0 as they perceive investment cost as high and so still continue to use cheap foreign labour instead. As a result,

the country's industry is regarded as being in between Industry 2.0 and Industry 3.0 in terms of manufacturing technology. Industry 4.0 can offer the manufacturing industry benefits such as increased flexibility of production and increased productivity. Engineers play an important role to support the industry towards Industry 4.0. The industry needs to constantly reinvent itself and the adoption of Industry 4.0 can be considered part of the improvement process. The digitalisation of the manufacturing process will help solve important business issues so that industries have a high chance of remaining relevant and reaping success in the long run. It is hoped that Malaysian industries will transform with Industry 4.0 to ensure international competitiveness and economy sustainability. ■

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Author's Biodata

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IEM DIARY OF EVENTS

Title: 2-Day Course on Negotiation Skills in A Project Environment

3-4 July 2018

Organised by: Project Management
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Time : 8.30 a.m. - 5.30 p.m.

CPD/PDP : Applying

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