GIO Digital Transformation in Smart Manufacturing Webinar – Meeting Minutes

Date: 28/4/2020

Part I: Meeting Executive summary

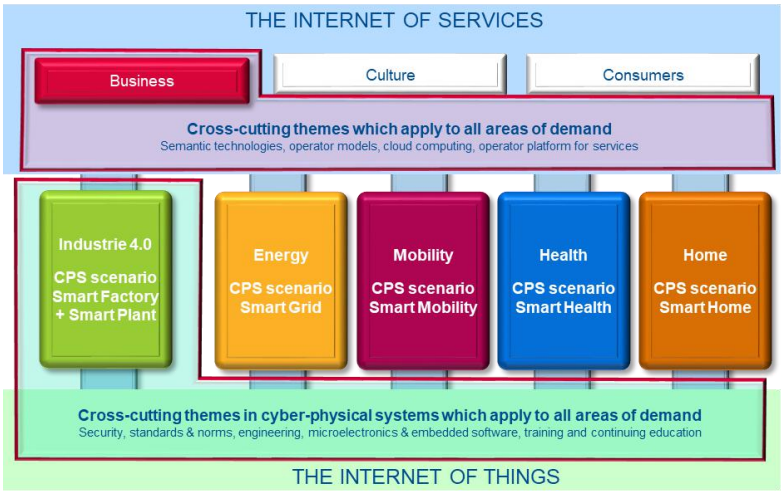
1. We live in an increasingly digitally connected world. Every sector is undergoing a digital transformation, supported by the internet of smart things, internet of services and internet of value chain. Connecting Users enable mass customization, Connecting Factory enable resource allocation optimisation, Connecting Logistics enable Data-driven Precision logistics services, Connecting Finance enable new financial service. Telecoms add value to a broader part of the Manufacturing industry value-chain.
2. This digital view of physical components provides continuous information, administration and communication services for every IoT across the full value chain. Data sharing on a peer-to-peer basis is very important since different words often have the same meaning in the digital world. Domain knowledge exchange between Manufacturers and supplier will enhance the efficiency.
3. The traditional industrial control systems and operational networks were in a closed network, the ubiquitous connectivity provided by 5G to IoT enables smart manufacturing sites to be integrated with cloud platforms for data processing, analytics and decision-making. The deeply integration of OT and ICT technology requires new digital infrastructure in Manufacturing.
4. 5G Communication technology needs improvements in deterministic networks, reliability and security for industrial applications, 5G Commercialisation on a large scale requires lower hardware and 5G communications costs. There is also a need to address the network deployment and AI algorithm. The existing 5G and AI technologies must be upgraded to support the implementation of the manufacturing as a service in future.

Part II: Detailed Records

Opening: Martin Creaner / Huawei Advisor – Opened by briefly introducing the six expert speakers and their talks

Manufacturing digitalization requires from the ICT infrastructure – Gunther Koschnick / ZVEI

We live in an increasingly digitally connected world. Every sector is undergoing a digital transformation, supported by the internet of smart devices and the internet of services. Common factors are vast numbers of cyber-physical IoT systems and the application of semantic technologies, cloud-computing and platform business models within smart services. The focus of this talk is Industry 4.0.



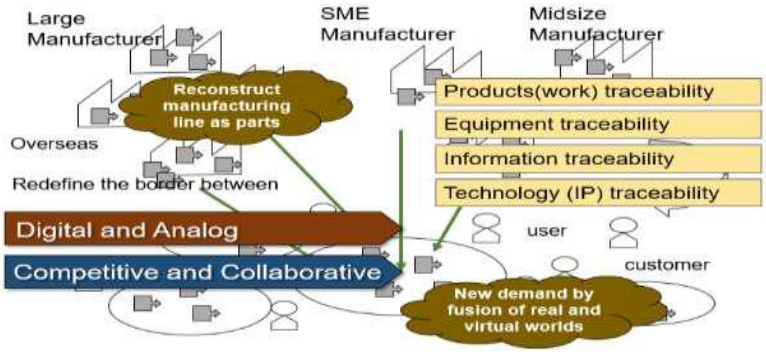
The three-dimensional Reference Architecture Model for Industry 4.0 (RAMI4.0) was introduced. RAMI4.0 is a structured model that links the three axes of the connected world, smart factory and smart products (axis one), with the product life-cycle value-chain (axis two) to a digital to real world business process to physical asset architecture (axis 3).

Core to smart manufacturing is the concept of the Asset Administration Shell (AAS), the "Digital Twin of Industry 4.0". This digital view of physical components provides continuous information, administration and communication services for every IoT across the full value chain. All components require an AAS to be part of Industry 4.0 and smart manufacturing. A unified information model and strong information security are inherent to the AAS.

5G is the killer application for Industry 4.0, since connectivity is the key enabler for cyber-physical production systems. The 5G Alliance for Connected Industries and Automation (https://www.5g-acia.org/) is the central global forum for shaping 5G for the industrial-automation industries.

Connected Industries Open Framework (CIOF) for Manufacturing in Japan - Hatsuko Koroku / IVI

Koroku-san introduced Japan's Industrial Value Chain Initiative (IVI) which now has over 700 members including many global companies. Key concepts for IVI are "Connected Manufacturing", "Human & Field Centric" (an Industrial Value Chain Implementation Method) and "Loosely Defined Standard", which enables data sharing on a peer-to-peer basis whilst protecting intellectual property, using a shared data dictionary, since different words often have the same meaning.



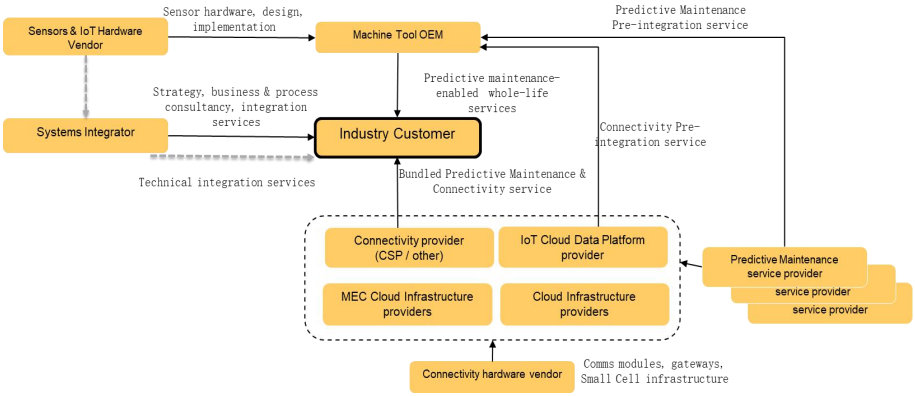
The Connected Industries Open Framework (CIOF) provides this peer-to-peer data sharing and data sovereignty management framework. CIOF provides templates for Service Profile, Data Profile and Contract Profile

Four practical CIOF use-case scenarios were presented, all of which had been demonstrated by IVI partner-companies:

1. **Data Ownership as Intellectual Property** ➔ Open & closed distribution process and usage management for data as intellectual property
2. **Quality Assurance by Data Sharing** - Enhancement of quality assurance by inspection data management and added value of manufacturing industry
3. **Value Process Integration across SMEs** - SME strengthening by integrating field data with business processes of business partners
4. **Decentralized Big Data Management for** AI - Adding Intelligence of equipment maintenance by big data analysis of production site using AI

IMPLEMENTING PREDICTIVE MAINTENANCE USING 5G AND EDGE - DAVID MOHALLY / HUAWEI SPO LAB

The key question that David Mohally posed was “How can telecoms add value to a broader part of the industry value-chain?” Industry connectivity revenue will be primarily tied to full-stack solutions, though customers will employ general connectivity to service, the main players explore new Control Value Network and new relationships between them



5G has several unique capabilities which help answer that question:

1. Ultra-reliability and security – data loss is avoided.
2. Device density and data volume – the ability to connect many more devices and capture more data
3. Ultra-low latency – data is effectively captured in real-time with below 10ms latency.

Huawei SPO Lab quantified with Keystone the value of 5G to the manufacturing supply chain up to 2025, alongside other vertical industries. A key finding was that the bulk of the value needs to be bundled with connectivity, i.e. this is what manufacturers want to buy.

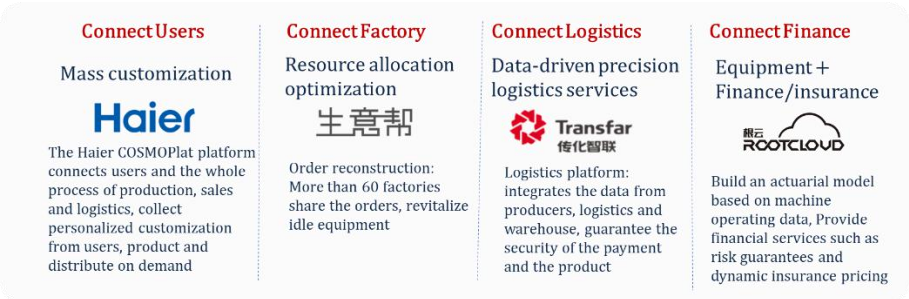
Huawei SPO Lab used its ecosystem mapping tool to map the manufacturing market-technology value-stack to identify candidate partners to work with. It used its use-case analysis tool to evaluate and prioritise large numbers (100+) manufacturing use-cases. The top ranked use-cases were explored in detail. An excellent example of cloud hosted predictive maintenance supported by the unique capabilities of 5G was given.

Experience and Practice of Manufacturing Digital Transformation in China - Zheng Li / Alliance of the Industrial Internet

The Alliance of the Industrial Internet supports the digital transformation of the Chinese manufacturing industry. Three strong factors are driving the demand for this digital transformation. These are the need to:

1. Improve efficiency (the margins of many Chinese SMEs are very low)
2. Improve quality and value (the per capital value-add of Chinese manufacturing is much lower than in Germany and USA)
3. Promote business innovation

Four business model innovation of digital companies that enable all these factors for their customers were given including: connect Users, Haier's mass customisation platform; Connect Factory, resource allocation optimisation over multiple factories that reduces idle equipment; Connect Logistics, Data-driven Precision logistics services, Transfer's data driven logistics platform that enables delivery on-time with security of payment; Connect Finance, provide financial service based on machine operating data.



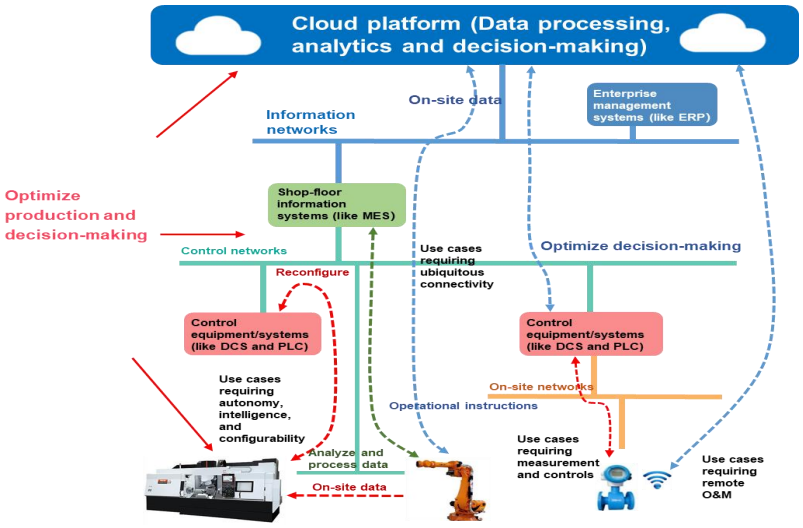
The approach to Digital Transformation is different in big enterprises from SMEs. Big enterprises focus on high value applications and on collaboration across their value chains. SMEs are able to acquire more resources and to digitally transform at a lower cost by using cloud services; e.g. low-cost ERP, CAD, CRM and on-line trading

The AII has a strong track record of success with 51 new technology test beds, 78 excellent application cases, 30 excellent network solutions, 13 typical security solutions and issuing 50+ reports.

Zheng Li emphasised that new technologies, new business models and value realisation are key factors in successful digital transformation, but the paths taken by SMEs and large enterprises are very different.

INDUSTRY 5G REQUIREMENTS – DAN LIU / INSTRUMENTATION TECHNOLOGY & ECONOMY INSTITUTE, PRC

In his talk, Dr. Dan Liu outlined that 5G changes the nature of industrial control systems and operational networks. Traditionally they were in a closed network, not directly accessible from outside. The ubiquitous connectivity provided by 5G to IIoT enables smart manufacturing sites to be integrated with cloud platforms for data processing, analytics and decision-making. Massive customization will require building blocks to become more flexible, portable, and modular.



The benefits of this include real-time control and predictive maintenance. The 5G use-case examples given included:

- Hazardous industrial environments, where wireless communications are essential, but existing technologies cannot satisfy industrial needs, but 5G can.

- 5G enabling device-to-device communications – a significant efficiency improvement over the traditional master-slave industrial communications model.
- Improvements in factory logistics with the use of autonomous vehicles to transport materials on campuses and in factories.
- Remote operation and maintenance (O&M) of large manufacturing equipment.
- AR/VR which facilitates O&M and technical training with immersive experiences
- Flexible factory production, as 5G enables rapid re-configuration of production lines
- Factories of the future, where there are no employees, only robots

The 5G requirements for industrial applications are much greater than just higher transmission speeds. They include:

- Performance indicators that are **deterministic** and **real-time** for both **availability** and **reliability**.
- Anti-interference (EMI) in harsh manufacturing environments.
- Stringent safety and data security requirements
- Industrial grade real-time operation, but these requirements vary depending on the application; e.g. plant automation is less demanding than robot motion control

The performance indicators provided by IEC 61784-2 were recommended as a guideline.

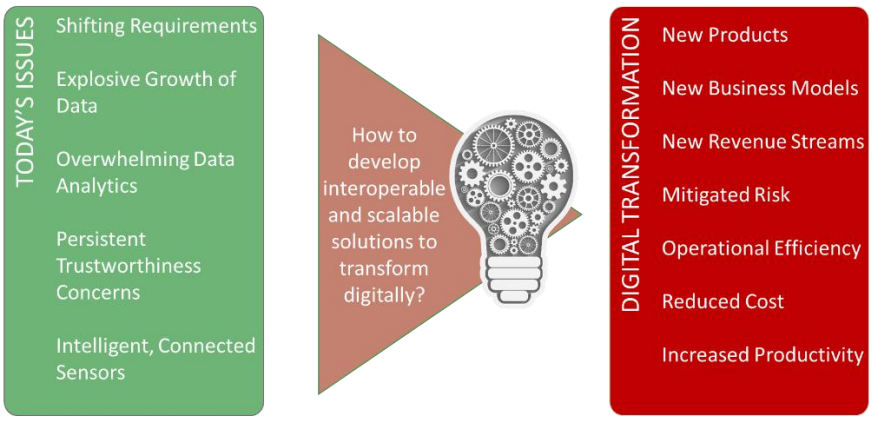
There are two major challenges to the introduction of 5G into the industrial environment:

- 5G Communication technology needs improvements in its deterministic networks, reliability and security for some industrial use-cases, and this needs to be tested and verified
- 5G Commercialisation on a large scale requires lower hardware and 5G communications costs. There is also a need to address the network deployment and communication quality (by some telecoms operators).

The Path to Digital Transformation - Michael Linehan / Industrial Internet Consortium

Although there are many existing trends pushing Digital Transformation (DTx), such as the explosive growth of data, Covid19 is driving the pace of DTx in many sectors.

Technology users need IoT experts, resources and testing options to develop interoperable and scalable solutions to confront the issues and achieve the goals and promise of digital transformation.



The Industrial Internet Consortium (IIC), with 200+ members, is helping its members to accelerate the DTx of their organisation, through its Accelerator Program, Toolbox, Foundation and Community activities. IIC's capabilities and services include:

- A structured Accelerator Program is driven by three elements: solution, technology and industry, with a duration varying between 3 months and 3 years.
- A Toolbox that includes a Project Explorer Tool, IoT Maturity Assessment Tool and a Security Maturity Assessment.
- IDX Foundation contains Frameworks, Reference Architecture, Best Practices, White Papers and Testbed results.
- DX Community provides an ecosystem, industry councils, special interest groups and an industry connect service.

Discussion

Given the value of the insights shared in the talks, the post-talk discussion focused strongly on the opportunities for future collaboration, in particular around 5G and AI smart manufacturing use-cases. Questions raised included "Can we identify common views on smart manufacturing use-cases?" – "Can we share them?", "Are some use-cases specific to some geographies?"

Michael Linehan of IIC suggested it might be possible to leverage IIC's Resource Hub, which is already populated with some 5G use-cases.

The meeting conclusion was that we should work out how we might collectively work together on practical projects related to 5G smart manufacturing use-cases.

Part III: Next Step

1. There may be value in organizing one or more workshops to share the different architectural & process models to the broad GIO audience and seeing what different industries can learn from each other's architectural and process models. The proposal is that forming a team of interested organisations and draw up a list of potential architectural & process models that have been developed by one organization but may

have a wider interest to other GIO participating organizations. And then arrange one or more workshops to allow the presentation of the models to interested parties.

2. There may be value in GIO looking at developing a shared library of smart manufacturing use cases for use by all GIO participating organizations, and cross-referencing them based on the demands they are likely. The proposal is that forming a team of interested organisations to develop this use case library. One or more workshops could be arranged to present these use cases.

ATTENDANCE

1. **Chair:** Martin Creaner (Huawei Advisor)
2. Chehaiping (Huawei)
3. Gunther Koschnick (ZVEI)
4. Hatsuko Koroku (IVI)
5. David Mohally (Huawei SPO Lab)
6. Zheng Li (AII)
7. Yuming Ge (AII)
8. Dan Liu (SAC/TC 124)
9. Wang Shuo (SAC/TC 124)
10. Michael Linehan (IIC)
11. Stephen Mellor (IIC)
12. Dirk Slama (IIC)
13. Howard Kradjel (IIC)
14. Luis Jorge Romero (ETSI)
15. Adrian Scrase (3GPP)
16. Markus Dilinger (3GPP)
17. Zhao Shizhuo (CCSA)
18. Luigi Licciardi (5GSA)
19. Joan O'brien (TM Forum)
20. Andreas Mueller (5G-ACIA)
21. Joseph Eichinger (5G-ACIA)
22. Chen Bin (AITISIA)
23. Yan Zhu (China Info 100)
24. Wang jinxiang (China info 100)
25. Rui Luis Aguiar (Networld 2020)
26. Andre Perdigao
27. Rahim Tafazolli (5GIC)
28. Ian Pannell (GSMA)
29. Yan Xu (ITS)
30. Jonathan Hopkinson (OPRC)
31. Fangjing (Huawei)
32. Zhouyaling (Huawei)
33. David Trevitt (Huawei)