WG Manufacturing
White Paper on Business Impact of IoT in Manufacturing Industries

Online • 13 July 2022
Agenda
15.00h  Opening and Welcome
        Alessandro Liani, AIOTI WG Manufacturing Chair

15.05h  Presentation of the White Paper and the Use Cases
        
        Introduction:
        Ulrich Löwen, White Paper Editor, Siemens (10 min)

        Presentation of the use cases (45):
        Ulrich Löwen, Siemens
        Cristina Rodriguez Vera, Hitachi
        Sergio Gusmeroli, Politecnico di Milano

        Recommendations and Next Steps:
        Ulrich Löwen, White Paper Editor, Siemens (10 min)

        Questions and open discussions (10 min)

16.20  Wrap up and end of Webinar
        Alessandro Liani, AIOTI WG Manufacturing Chair
About AIOTI WG Manufacturing
Manufacturing

Vision: Facilitating secure Smart Manufacturing Industry. Smart Manufacturing Industry is based on successful collaboration of OT & IT, implementation of Industrial IoT (IIoT) technologies and new active stakeholders

Scope: Define the value of using IoT and edge computing in supporting Manufacturing sectors to reach goal on 2021-2027 challenges
Highlights

Relevant facts
- 87 member organisations
- 122 participants

Main achievements
1. Developing Manufacturing SRIA
2. Developing Manufacturing Track on IoT Week 2021
3. Successful workshop Business Impact of IoT in Manufacturing Industries held on 08.02.2022
4. Matchmaking for EU funding calls in manufacturing domain
Priorities 2022

1. Develop a report on methodology on applying IoT on Manufacturing
2. Collect case studies on benefits of IoT integration on manufacturing plants
3. Prepare report on approaches and solutions on using IoT, AI and edge computing to support sustainable manufacturing
4. IoT Week 2022: design and lead Manufacturing Track sessions
Introduction and Overview of the White Paper

Ulrich Löwen, White Paper Editor, Siemens
Introduction: Methodology multi-stakeholder Business Model Navigator

- In the context of an Industrial IoT business case it is typically not enough to consider a single provider-customer relationship but an overall value network.

- In this value network a convincing value proposition for all participants should be developed, even if this implies some changes in the current business models of the stakeholders.

- This conceptual approach is aligned with the methodology proposed by the working group "Digital Business Models" of Plattform Industrie 4.0 to analyse practical examples.
Introduction (2): Value Network

- The starting point for the analysis and documentation of a business scenario is the description of a value network.
- A value network is a directional graph consisting of nodes and edges. The nodes of the graph are business stakeholders and the edges of the graph are business relationships. Each node represents a business role and comprises a description of the underlying business model. Each edge represents a value proposition of a provider to a customer.
- The individual business roles in a value network are assumed by enterprises. This is indicated by colouring the business roles, whereby each enterprise is represented by a specific colour. An enterprise may assume several business roles, thus, business roles coded by the same colour are assumed by a single enterprise.
Introduction (3): Business Model

- The value network is complemented by a description of the business model of each enterprise. The description uses the St. Gallen Business Model Navigator method. This method is based on a magic triangle with 4 dimensions, see Figure:
  - Who (customer): What are the target customers of the enterprise?
  - What (value proposition): What is the offering of the enterprise to the customer?
  - How (value chain): How does the enterprise produce the deliverable?
  - Value (revenue mechanism): How does the enterprise create revenues?
Introduction (4): Business Model Innovation

- To distinguish business model innovations from product or process innovations at least two dimensions should be involved in a significant way.

- “Significant” means that the considered dimension is addressed structurally in a different way. Examples for significant changes are addressing a new market segment, integrating a new business partner in the value chain or a recurring usage-based payment instead of a one-time payment.

- The assessment whether a change is significant is to a certain degree a subjective assessment.

- Figure illustrates how the analysis of business model innovation can be integrated into the illustration of the value streams.
Presentation of the Use Cases
The application of Industrial Edge is explained using the example of a component supplier, who wants to offer data-driven services. Technically, the service is realized by an edge application, but the component supplier does not want to integrate an edge device into its component. By using Industrial Edge the edge application can be centrally managed and deployed on any edge device supported by the Industrial Edge. Such an edge device can be part of a machine or the overall plant.
Siemens Industrial Edge: Value Network

- The value network shows the classic value chain, in which components are integrated into machines and these are integrated by system integrators into a plant of a manufacturing company. The edge devices on which the component supplier would like to deploy its edge application can be integrated into the machine by the machine supplier or into the plant by the system integrator. The component supplier offers the data-driven service to the machine supplier or the manufacturing company.

- As an edge management provider, Siemens offers partners in the value chain various edge management services, for example services to edge device supplier to make its edge devices accessible to edge management; services to machine supplier and system integrator to integrate and manage edge devices and to deploy edge applications on the edge devices; services to the component supplier to make own edge application available to the machine supplier, system integrator or the manufacturing company; and services to the manufacturing company to be able to deploy edge applications on edge devices of the plant.

- Typically, the various stakeholders in the value network charge for the purchase of their components and the use of their services. The component supplier may compensate the machine supplier or the manufacturing company for the use of the provided edge device.
Siemens Industrial Edge: Business Model Innovation

- The edge management provider is establishing itself as a new partner in the value network. Thus, all four dimensions change significantly for the edge management provider. Because of the integration of the edge management provider also the value chain for the other partners changes in a significant way.

- In addition to the value chain, the other three dimensions of the component supplier are also changing significantly: the customer, because the manufacturing company is addressed as a new customer segment, the value proposition, because new data-driven services are offered, and the revenue mechanism, because, in contrast to the one-time payment for components, data-driven services are billed usage or even outcome based.
Siemens DocuHub: Overview

Today, document handling drives operational expenditure and risks during operation of complex equipment. Documents are exchanged in many technical ways based on highly manual, specific, and thereby costly workflows. Often there are more than 10,000 equipment per plant and more than 20 documents per equipment. Therefore, today equipment information often is not available when needed, for example 80% of maintenance time is needed to find the correct information.

To address these challenges Siemens provides DocuHub, a shared system offering services to assign metadata to documents and to legally exchange documents between equipment provider and equipment operator. Using these services an equipment operator has up to date and consistent documentation of equipment and an equipment provider can make the documentation for an equipment available in an easy way. In addition, an equipment provider can offer additional documentation related services over the lifecycle of the delivered equipment, for example notification services regarding updated documents.
Siemens DocuHub: Value Network

- The value network shows the classic value chain, in which equipment is integrated by system integrators – for example a machine supplier – and the integrated system is delivered to a plant operator. In addition, the plant operator uses the services – for example engineering or maintenance services – of solution/service provider.

- All these partners act in the role of document providers. For example, the equipment provider and system integrator provide documents about the equipment or integrated system, the solution/service provider documents about the services provided and the plant operator documents about the operation of its plant. Assuming the role of document providers they can use specific Siemens DocuHub services.

- System integrators, solution/service providers and plant operators also act in the role of document consumers. For example, a system integrator receives documents from an equipment provider, a plant operator receives documents from a system integrator or solution/services provider and a solution/service provider can receive documents from all other partners in the value network. Assuming the role of document consumers they use further Siemens DocuHub services.

- Typically, the various stakeholders in the value network charge for the purchase of their equipment, systems, solutions, and services and for the used services of Siemens DocuHub.
Siemens DocuHub: Business Model Innovation

- Siemens DocuHub is establishing itself as a new stakeholder in the value network. Thus, all four dimensions change significantly for Siemens DocuHub. Because of the integration of Siemens DocuHub also the value chain for the other partners changes in a significant way.

- In addition to the value chain, for the equipment provider, system integrator and solution/service provider also the value proposition and revenue mechanism change significantly, because they can offer additional document related services to their customers based on Siemens DocuHub and in contrast to the one-time payment for equipment, system integration, or solution, the additional document related services are billed usage based.
**Hitachi Maintenance assistance and predictive maintenance: Overview**

**Context:**
New technologies → efficiency, ↑ complexity maintenance, ↑ knowledge transfer needs.

**IoT-based solution overview:**
- 4M data (huMan, Machine, Material, Method) for training & AR assisting workers, tracking of maintenance.
- AR application checks machine & material, displays machine status, and shows step-by-step.
- Hitachi’s AI-based human activity recognition (HAR) validates worker’s actions and confirms task execution.
- IoT device with edge-AI to process sensor data, run HAR technologies, and synchronize AR application.
- Digital log: Predictive Maintenance (PdM), Data Analysis & KPI monitoring, and Maintenance Optimisation
Hitachi Maintenance assistance and predictive maintenance: Demo video
Hitachi Maintenance assistance and predictive maintenance: Value Network

- Hitachi’s Digital Transformation: Integrates industrial products business and IoT services into IIoT platform.
- Hitachi’s AI-edge device collects, processes and sends the 4M data.
- Maintenance & Repair (M&R) solution: informing workers, PdM, data analysis, and scheduling optimization.
- Plant operator reduces his expenditure for machine maintenance, operating more profitably.
Hitachi Maintenance assistance and predictive maintenance: Business Model Innovation

- Hitachi has IT and OT business, the combination of areas of expertise allows value creation in all 4 dimensions.
- Integrating machine delivery and M&R solution reduces maintenance & warranty cost.
- Hitachi IT business provides added value services such as PdM and Optimized Scheduling.
- Manufacturing company learns who, when, and how to perform maintenance tasks.
- Maintenance operation becomes a collaborative scheme. Maintenance data is shared to the machine supplier to provide value proposition services.
The welding cell of FIAT Melfi Campus plant is equipped with a PRIMA POWER Laser Machine Platino Fiber 1530, enriched with several additional sensors for health status monitoring and maintenance. Moreover, AGVs fleets provide in real-time huge quantities of data regarding their status, power consumption, wear-out, mission status. Thanks to FIWARE Open Source Industrial IoT framework data from the shopfloor is pre-processed and filtered at the edge and then submitted to the Siemens Mindsphere industrial cloud for further elaborations. In particular, an Innovation SME is in charge to access both PRIMA and FIAT tenants in Mindsphere and to elaborate an advanced Predictive Maintenance solution integrating needs from the PRIMA machine and from the FIAT AGV fleet.
Four main stakeholders are included in this example: the Machine Supplier (PRIMA), the Plant Owner (FIAT), the Cloud Infrastructure Provider (SIEMENS) and the Advanced Application Developer (SME). PRIMA monitors the delivered machines (in a fleet management system where all the Laser Machines of the same typology are monitored and diagnosed) by using edge to cloud industrial IOT platform and services and delivers maintenance services. FIAT monitors AGVs and the status of the whole plant through its SCADA and ERP systems. SIEMENS provides the loud data infrastructure, respecting security and data confidentiality constraints. The SME is allowed to access both PRIMA and FIAT Tenants and develop advanced preventive maintenance plans, harmonizing the needs of both PRIMA and FIAT and exploiting the cloud infrastructure of SIEMENS (Mindsapp). This is a brand new business model for SMEs ecosystems which is enabled by the presence of an open edge-to-cloud infrastructure and by a digitally enabled value network.
The four stakeholders in the FIAT Melfi Predictive Maintenance scenario need to harmonise and coordinate their Business Models in order to implement the scenario. SIEMENS and its cloud platform IoT is implementing its own business models. This is a very disruptive business model for SIEMENS, especially in the new value proposition and revenue mechanisms. FIAT needs to modify its revenue mechanisms (including Data Provision and Data Economy) and value chains, by adding new stakeholders. PRIMA mostly focuses on its value proposition, by implementing a transition between pure product-driven business to a more dynamic product-service business model (Servitisation). This has a very relevant impact on revenue mechanisms and establishes new relations in the value chain. The totally new actor in this value network is the SME who has to totally renew its business especially in consideration to the SIEMENS Mindsphere and its MIndsapp ecosystem.
Recommendations and Next Steps (1)

- The examples show following effects on the value networks in the manufacturing industry:
  - Companies use the (technical) capabilities of the IoT to establish themselves in the value network
    - A company establishes itself as an IoT platform operator, i.e., its business purpose is to operate an IoT platform, offer services to the users of the platform and monetize them
    - A company offers new products and services to a dedicated customer, typically intelligent devices supplier as core value proposition supplemented by related consulting services
  - Companies use the offers of the new companies in the value network to innovate their own business model
  - Companies use the offers of the new companies in the value network to optimize their own value-added processes without significantly changing their current business model
Recommendations and Next Steps (2)

- From a technical perspective, many examples use an IoT platform. However, from a business perspective, the examples show different applications of such a technical platform:
  - The technical platform is used to earn money by operating the platform
  - The technical platform is used as a basis to offer own services
A company in the manufacturing industry should consider what position it assumes in the value network today and what position it intends to assume in the future.

- They can use the examples described for inspiration, but they must make this strategic decision on their own responsibility.
- To be able to make well-founded decisions, a company should get involved in appropriate communities such as AIOTI to discover and discuss their current and future business opportunities of the IoT.

- It is planned to update the white paper and to add further examples.
References

- Digital business models for Industrie 4.0, [Link](#)
- The St. Gallen Business Model Navigator, [Link](#)
- G. Parker, M. Van Alstyne and S. Choudary: Platform Revolution, [Link](#)
Thank you for listening

Any questions?
You can find us at @AIOTI_EU or email sg@aioti.eu