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A BENCHMARK OF CONNECTED SERVICES

in the Manufacturing Industry

ABSTRACT

Technology is not only changing the way we live and work, but it is also changing business models in all industries. This is especially the case in the manufacturing industry, in which manufacturers connect their products to the internet to provide so called Connected Services.

Our research shows that Connected Services generally vary in **WHAT** they offer and **HOW** they are implemented, and that manufacturing industries are adopting Connected Services at a different pace and with a different focus.

The difference in Connected Services among industries implies that manufacturing companies can and should learn from each other in terms of **WHAT** Connected Services they offer and in terms of **HOW** they implement and commercialize Connected Services.

INTRODUCTION

Technology is changing the way companies do business

Technology is not only changing the way we live and work, but it is also changing business models in all industries. Let us consider the manufacturing industry: in the traditional business model, customers would buy products and potentially services related to these products. However, we see business models shifting to pay-per-use and pay-per-output, in which customers do not pay for the actual product but for the benefits that the product brings.

These new business models are examples of so called Connected Services. These are services that can be provided when connecting products to the internet, e.g. condition monitoring or predictive maintenance. From a manufacturer's perspective, Connected Services provide many benefits: they can be used to better fulfill customer needs and to differentiate from competitors, they provide regular revenue streams that are less dependent on economic cycles, and they provide higher margins since consumers often have a higher willingness to pay for services than for physical products.

The speed of adoption varies across the manufacturing industries

Connected Services generally vary in WHAT they offer and HOW they are implemented. Our research shows that manufacturing industries are adopting Connected Services at a different pace and with a different focus.

In the agriculture industry for example, some companies stand out by WHAT kind of Connected Services they offer to their clients. Innovative Connected Services provide customers with the ability of precision farming and fleet management to improve the usage and maintenance of their agricultural machines. Meanwhile, the healthcare industry is strong in HOW Connected Services are provided to the market. Remote monitoring and maintenance on a subscription basis are common Connected Services, e.g. for clinical devices.

The difference in Connected Services among industries implies that manufacturing companies can and should learn from each other in terms of WHAT Connected Services they offer and in terms of HOW they implement and commercialize Connected Services.

This study provides insights into the current Connected Services landscape in the manufacturing sector and can serve as a basis for companies to identify their individual opportunities and challenges on the journey to Connected Services mastery.

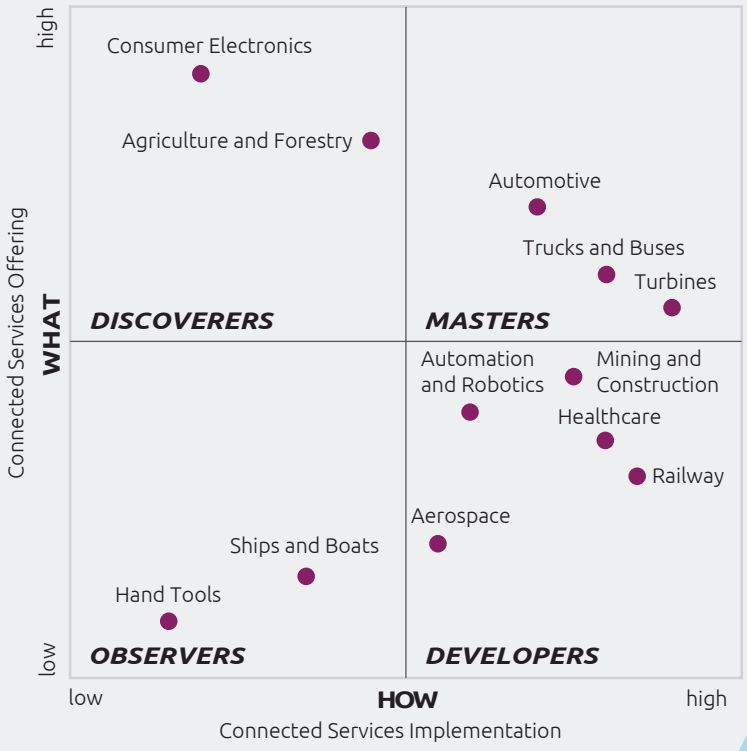
CONNECTED SERVICES BENCHMARK

In this study, we have evaluated the Connected Services maturity considering the current Connected Services market offering of the top players in every manufacturing industry (WHAT) and the maturity of the implementation of this offering (HOW). We have examined both dimensions from the point of view of customer needs, technology capabilities and physical product design. The study is based on our own research of existing service offerings in each manufacturing industry and on interviews with industry experts.

We have visualized the positioning of the assessed manufacturing industries in a graph divided into four quadrants: observers, discoverers, developers, and masters. Each of the quadrants shows certain characteristics:

OBSERVERS have a low maturity regarding what Connected Services they offer and how they offer these services. Industries in this quadrant offer basic Connected Services to their customers. DISCOVERERS offer market-leading services but they are generally not able to reach a broad market coverage. Industries that serve broad markets and offer only basic Connected Services are in the quadrant DEVELOPERS. Companies that offer the most sophisticated services and excel in service implementation as well as high market penetration are classified as MASTERS.

Connected Services Maturity Matrix



OBSERVERS
Simple services offered to few customers and still in the introductory phase

Hand Tools | *Includes hand tools with self-contained drive including drills, grinders, sanders, saws, etc.*

WHAT

- Basic Connected Services offering for remote control and tool tracking
- Connected Services around fleet management are trending

HOW

- Connected Services are in an early stage of their life cycle
- Adoption of Connected Services mostly by B2B customers

Ships and Boats | *Includes all kinds of water vessels including cargo ships and passenger boats*

WHAT

- Communication services connect vessels with other vessels and external parties
- Basic traffic management services provide real-time information

HOW

- Services are primarily implemented by ICT providers
- Connected Services are in an early stage of their life cycle

Observers

In the *Hand Tools industry*, not all companies offer Connected Services. Most of the Connected Services offered in that industry focus on remote control and monitoring. Connected Services around geo fencing allow the tracking of tools on the construction site and their shutdown in case of surpassing pre-defined perimeters. Connected Services enabling fleet management of tools are trending within that industry. Generally, Connected Services are still in an early stage within the Hand Tools industry.

The most relevant Connected Services in the *Ships* and *Boats industry* focus on communication and information provisioning. Communication services connect vessels with service providers, partners and authorities. Traffic management services provide real-time information about speed and routes. These services are typically offered by information and communication technology providers.
Ships and Boat manufacturers play a secondary role when it comes to Connected Services. In general, Connected Services in the Ships and Boats industry are still in an early stage.

DISCOVERERS
Innovative services not yet adopted by a large customer group

Consumer Electronics

Includes smartphones and TVs, household electronics like fridges and washing machines

WHAT

- Connected Services are offered around smart home solutions and automation
- Home appliances can be controlled remotely and enhanced by information services

HOW

- Home appliance manufacturers and smart home solution integrators drive innovation
- Connected Services are adopted by a minority of customers so far

Agriculture and Forestry

Includes machines for the purpose of farming or forestry such as tractors, feeding systems, harvesting machines

WHAT

- Connected Services are offered around fleet management and condition monitoring
- Precision farming supports farmers e.g. in field management and optimization

HOW

- Connected Services have not achieved high adoption rates yet
- Increased commercial use will bring the industry closer to Connected Service Masters

Discoverers

The *Consumer Electronics industry* offers a wide range of Connected Services around smart home. The devices are connected and enable energy monitoring, home automation (e.g. for lighting, heating and ventilation) as well as remote control and information services for other home appliances (e.g. freezers, washing machines and cooking appliances). Manufacturers of home appliances as well as software vendors that act as home appliance integrators drive innovation. Connected Services within the Consumer Electronics industry are adopted by a minority of customers.

Similarly, *Agriculture and Forestry* equipment companies offer innovative Connected Services but have not achieved high adoption rates among their customer base yet. Key players in that industry offer Connected Services like condition monitoring, fleet management and precision farming. Condition monitoring encompasses real-time monitoring of agriculture and forestry machines leveraging data captured by machine sensors. Precision farming leverages location data in combination with external data sources, e.g. to optimize seeding and harvesting. If companies in this industry continue to develop innovative Connected Services and increase commercial use of these services, the industry will move towards the masters quadrant.


09:34am
smartHome
HOME AUTOMATION
STATUS
RECORDING..
DEVICE
BACKYARD
CAMERA

DEVELOPERS

Basic services offered to a wide range of customers

Railway

Includes all kinds of rail vehicles and rail equipment

WHAT

- Safety reasons for traffic management pushed development of connected trains
- Connected Services are offered around condition monitoring and predictive maintenance

HOW

- Regulatory push resulted in an early and wide-spread adoption of connected trains
- Railway manufacturer will use IoT platforms to act as service providers in the future

Healthcare

Includes equipment for medical imaging, surgical appliances, hearing aids, diabetes care, etc.

WHAT

- Connected healthcare consumer devices enable health tracking and remote control
- Condition monitoring and remote maintenance in the B2B market

HOW

- Adoption of connected consumer devices is hindered by data protection concerns
- Connected Services are partly standard for clinic and laboratory devices and machines

Mining and Construction

Includes equipment for construction and surface or underground mining

WHAT

- Monitoring services such as condition monitoring with predictive maintenance are trending
- Fleet management enables services such as fleet benchmarking and geo fencing

HOW

- Connected machines as well as Connected Services are very common in this industry

Automation and Robotics

Includes industrial robots and automation systems used in the manufacturing of products

WHAT

- Monitoring and diagnostics services enable real-time monitoring and predictive maintenance
- Remote management allows to control connected machines and equipment

HOW

- Connected Services benefit from a basic degree of connectivity
- IoT platforms and technology companies play an important role in future growth

Aerospace

Includes all kinds of aircrafts, airplanes as well as jets and helicopters

WHAT

- Fleet management services, e.g. fleet performance and maintenance management
- After-sales services for collaboration with customer service centers and technicians

HOW

- Connected Services are still in an early stage in the Aerospace industry
- Most of the aircraft customers adopt the offered Connected Services

Developers

Safety reasons and traffic management have led to an early introduction of connected trains and infrastructure within the *Railway industry*. Connected trains enable, for example, automatic train controls, traffic management systems as well as automatic train protection systems. Connected Services focus around condition monitoring and predictive maintenance of trains and railway infrastructure. Through the regulatory push, the Railway industry has a high adoption rate and long experience with connected trains and infrastructure.

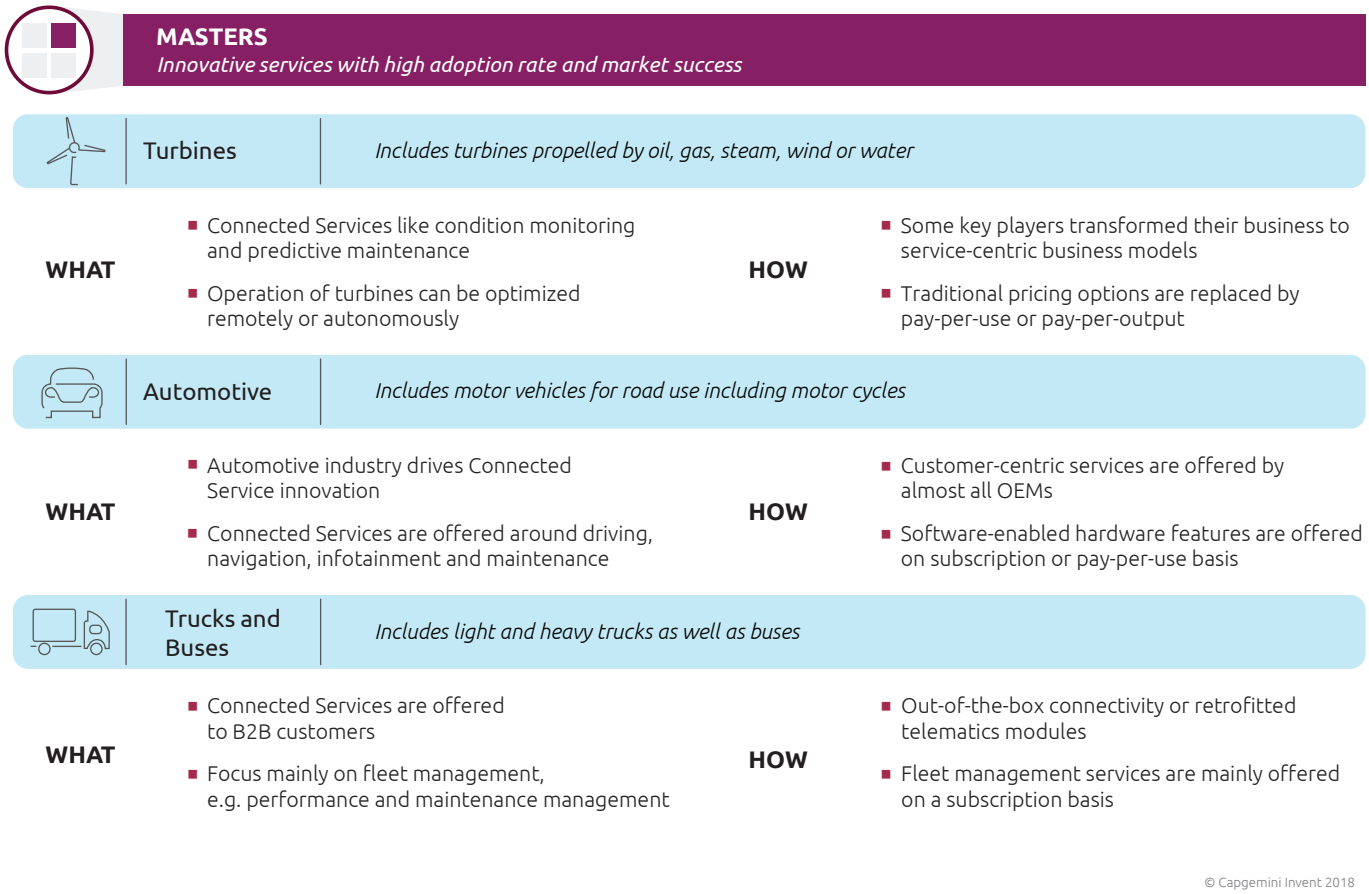
Connected Services in the *Healthcare industry* are offered in the business-to-consumer (B2C) and business-to-business (B2B) environment. In the B2C market, connected healthcare devices enable, for example, health tracking (e.g. blood pressure, heart rate and blood sugar level) and remote control (e.g. hearing aids and insulin pumps). However, adoption of connected devices in the B2C market is hindered by data privacy concerns.

In the B2B market, connectivity of machines is partly standard. Connected Services offer condition monitoring and remote maintenance of clinic and laboratory devices and machines (e.g. for imaging machines).

Mining and Construction equipment companies offer Connected Services like monitoring and fleet management. Monitoring services provide information about the location and performance of machines. Condition monitoring optimizes machine maintenance and provides the basis for predictive maintenance. Fleet management pairs data from inspections, performance and repair history and provides fleet benchmarks, while it also enables geo fencing. Connected machines are very common in the Mining and Construction equipment industry.

Connected Services in the *Automation and Robotics industry* generally benefit from a basic degree of connectivity within that industry. Key players offer Connected Services like monitoring and diagnostics services as well as remote management of machines and equipment. IoT platforms as well as tech companies play an important role in the context of industrial automation. An increasing adoption of IoT platforms will further drive Connected Services growth in this industry.

Key players in the *Aerospace industry* offer similar Connected Services mainly around fleet management and maintenance. Aircrafts equipped with sensors are monitored remotely to support the customer service centers and technicians, e.g. for performance management, setup of maintenance plans, fault detection and notification purposes. Although Connected Services are still in an early stage, they are adopted by most of the aircraft manufacturer's customer base.



Masters

First concepts of Connected Services were offered in the *Turbines industry* years ago. Nowadays, most of the key players offer services around condition monitoring, condition-based and predictive maintenance. Innovative services allow to optimize the operations of turbines remotely or autonomously. Some of the key players even extended their traditional value creation and implemented service-centric business models to offer their traditional products on a pay-per-use or output basis.

Nowadays, the *Automotive industry* gets a lot of attention for their Connected Services. We observe that the Automotive industry drives innovation in Connected Services. The transformation from hardware sellers to mobility providers, increasing competition inside and outside the traditional market as well as sinking margins drive Connected Services innovation within that industry. Typical Connected Services are offered around features such as driving, navigation, infotainment and maintenance. Pricing options such as subscription and pay-per-use do not only apply to the provision of mobility (e.g. car sharing) but also to the provision of software-enabled hardware features.

Connected Services in the *Trucks and Buses industry* are targeting B2B customers. Most of the Connected Services focus on fleet management. New trucks and buses are already equipped with telematics modules. Older vehicles can be retrofitted with telematics modules afterwards. The fleet management system gathers data on driver behavior, vehicle performance and some are even able to predict maintenance needs. Fleet management services are offered generally via a yearly subscription to B2B customers.

YOUR PERSONAL JOURNEY TO CONNECTED SERVICES MASTERY

The transformation to Connected Services Mastery is a complex task, and different units of a company need to be involved to understand the customer, the product and the required technology. Considering this, one might wonder what the best solution for one's own company is. Experience shows that solutions that are good for one company are not necessarily good for another – there is no "one size fits all" solution. However, we have identified a set of recommendations that help companies avoid common pitfalls in their transformation.

Understanding the customer needs is the first step

Observing and interviewing customers provides information about their activities, sentiments, and pain points. The resulting customer insights can be used to segment the customer base and improve customer understanding. Additionally, early engagement of customers can also help to design, validate and condense service ideas as well as identify key features.

Business and IT capabilities need to be built up or transformed to enable Connected Services

This transformation generally includes a new operating model and adaptions of front and back office processes as well as people training and development. The IT application and infrastructure landscape needs to be changed to enable connectivity as well as establish the needed data processing and analytics capabilities.

Focus on short innovation cycles and do not try to boil the ocean

We recommend focusing on short development cycles and a quick value impact. Implemented in the sense of a minimal viable product, piloted and scaled to market introduction, Connected Services will be continuously developed based on received customer feedback.

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For more details contact:

Dr. Leonardo Weiss
Principal
+49 151 4025 1135
leonardo.weiss@capgemini.com

Christian Beining
Senior Manager
+49 151 4025 0137
christian.beining@capgemini.com

Additional Authors

Florian Bacher

Thomas Schatzer

Katharina Friedmann

Tanja Ulmer

Stephanie Göttche

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