KPMG

Connected machines

A game changer in industrial manufacturing?
Whitepaper

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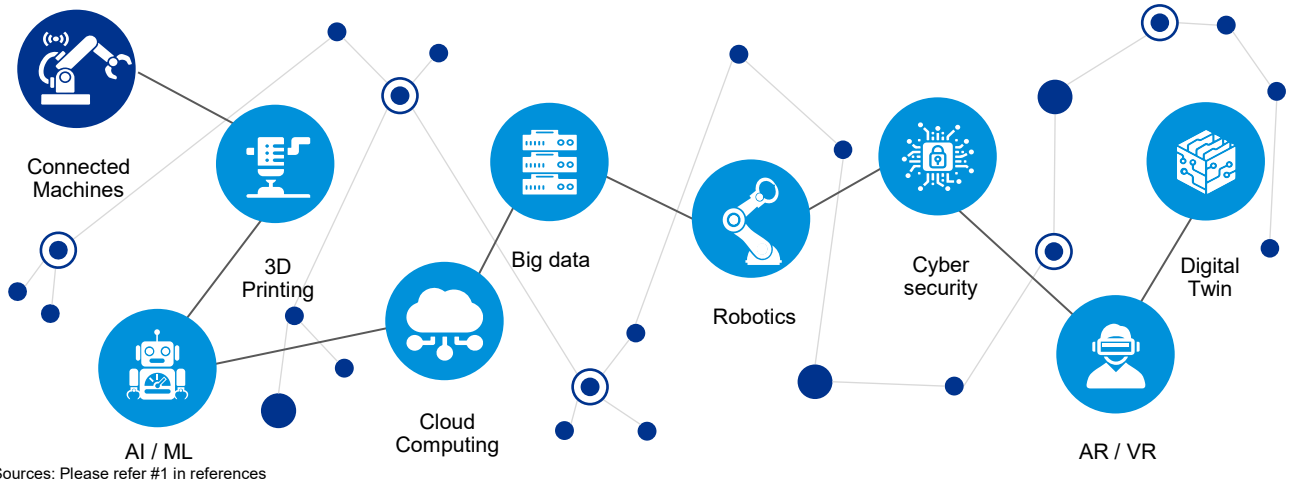
Connected machines - what is it all about?

A connected machine ecosystem comprises industrial assets inter-linked via software and intelligent technologies, to drive smarter and more agile decisions.

Key elements of Industry 4.0



Sources: Please refer #1 in references

Industry 4.0, a revolution driven by advancements in technology, integrates physical operations with smart digital technologies (such as AI, industrial IoT, blockchain, connectivity infrastructure, etc.) to create a more holistic, interconnected, and a cyber-physical system for manufacturers. A connected ecosystem, which enables industrial IoT (IIoT), acts as a building block for manufacturers in realizing the Industry 4.0 benefits.

Strong growth outlook of connected machines, due to rising adoption by industrial manufacturers

€90.5 bn

Projected value of the global industrial IoT[(a)] market by 2026

6.7%

CAGR during the forecast period, 2021-26F

36.8 bn

Projected volume of global industrial IoT[(a)] connections by 2025

15.8%

CAGR during the forecast period, 2020-25F

Sources: Please refer #2 and 3 in references

Notes: (a) Market size of industrial IoT considered as it comprises connected machines in industrial manufacturing

Why should I implement connected machines?

Increase your customer satisfaction, boost operational efficiency, bring down costs and raise profits, while avoiding falling behind competition, downtimes and losses in productivity.

Benefits of a connected machines value chain

Manufacturer

- Cost savings
- Efficiency gains
- Improved customer experience

Dealer / service provider

- Remote maintenance
- Efficient workforce utilization
- New / extended service offerings

End customer

- Reduced downtime
- Reduced service costs
- Tools for automation

Case in point

Realized benefits and rising demand for connected machines is pushing integrated IM players and software providers to augment their offerings

IM players

Siemens Electronics Works, Germany

140%
Factory output achieved 2017-21

Implemented a lean digital factory approach, powered by predictive maintenance and AI

Schneider Electric, Indonesia

70%
Supplier service rate[a]

Embedded sensors in connected machines to enable monitoring and transfer of real-time data to suppliers

Service providers

Dematic

Acquired Digital Applications International for €120 million to boost its logistics software offerings

Konux

Developed an AI-based predictive maintenance system to enhance railway infrastructure

Sources: Please refer #9, 11, 14, 15 and 16 in references

Risks of not implementing connected machines

Case in point

- Loss of revenue / profitability
- Stunted business growth

€0.2 million[b]
Per hour cost incurred by a factory due to unplanned downtime

5%–20%[b]
Loss in productive capacity of a factory due to downtime

- Product / service obsolescence

Big data-driven, smart processes could replace traditional welding procedures

App-controlled vehicle access and keyless ignitions could replace car keys

Sources: Please refer #13, 17 and 33 in references

How KPMG can help: KPMG's Advisory services help you identify "cost efficiencies" and "productivity gains".

Learn more

Notes: (a) Supplier service rate is an indicator displaying the quantity and date from warehouse to external suppliers or from the stores to central and external supplier; (b) Based on results of global surveys conducted by Aberdeen Research and Emaint

Beyond money - what else does it bring?

Generate additional revenue streams with profitable business models such as 'outcome-as-a-service', and attain your Sustainable Development Goals (SDGs) with reduced carbon footprint and efficient processes.

Servitization

It is a business model achieved through connected machines, which enables manufacturers to sell products as a service rather than the product itself. With stiff competition resulting in reduced margins on manufactured goods, manufacturers are wirelessly connecting their products to seek additional revenue via aftermarket services. It includes analysing performance patterns to generate automatic work orders for maintenance and repair.

Benefits

- Recurring income
- Better customer relationships
- Service as a value creator

Challenges

- Large operational changes needed
- Tricky price setting
- Cultural transformation from a product to a service-centric mindset

Case in point

Kaeser Compressors

- Air-as-a-service (Connected air compressors)
- Pricing based on quantity consumed of compressed air

The Michelin Group

- Tire-as-a-service (smart tires track air pressure to assess replaceability)
- Pricing based on distance travelled

Heidelberg Lensing

- Printer-as-a-service (Subscription-based printing services)
- Pricing based on pay-per-use

Sources: Please refer #20, 22 and 23 in references

Sustainable Development Goals (SDGs)

An added advantage of connected machine implementation is the ability of industrial manufacturers to address many of the 17 goals set by the UN, to be implemented by 2030.

SDGs addressed by IM players[(a)]

SDG 3 – Good health & wellbeing

SDG 8 – Decent work & economic growth

SDG 12 – Responsible consumption & production

SDG 13 – Climate action

Case in point

Groupe Renault, France[(b)]

-50% Safety incidents

I4.0 technologies (cobots and VR) to enable digital-enabled service training to support operators

Schneider Electric, USA[(b)]

-78% CO_2 emissions

Digital energy management to curb green house gas emissions and combat climate change

Hitachi, Japan

-16% CO_2 emissions

IIoT and data analytics to enable an efficient digital energy management system

Sources: Please refer #10 and 11 in references

How KPMG can help: KPMG can support you with our "Growth" and "ESG focused" programs.

Learn more

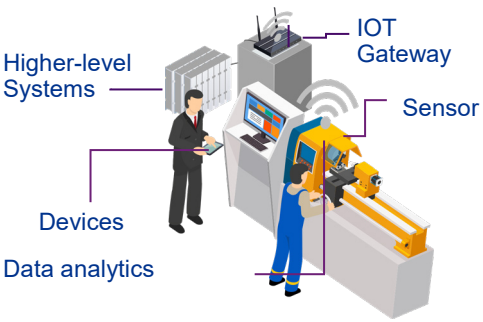
Notes: (a) Basis KPMG analysis; the list is indicative and not exhaustive; (b) Numbers for efficiency gains in the above-mentioned companies pertain to plants where connected machines have been implemented

Implement connected machines - which path to take? (1/2)

One of the ways to deploy connected machines entails in-house implementation – either by adding smart components to legacy equipment or building new customized facilities.

Brownfield

Upgrading existing machinery by adding technological solutions such as sensors, IoT gateway, and data visualization capabilities.



Benefits

- Reduced capex, quicker ROI
- Quicker adaptation to requirements
- Targeted at recurring and critical issues, eliminating unnecessary deployments

Challenges

- Software and hardware integration
- All machinery may not be retrofit-ready
- Potential security risks in linking old equipment with new equipment

Case in point

Bosch

Upgraded a legacy workbench by using IoT gateway to ensure quality control. Received the first pay-off in just 18 months

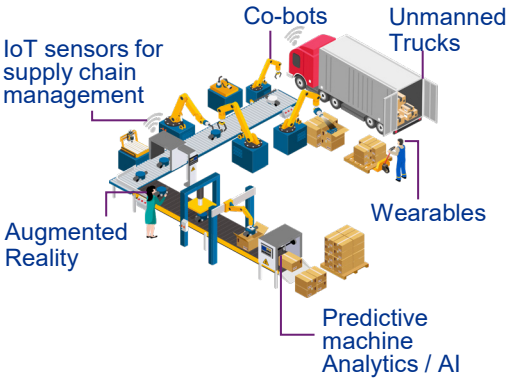
Ericsson

Added sensors with mobile IoT connectivity for monitoring and analyzing production, saving €196 per IoT sensor as compared to cables

Sources: Please refer #38, 41 and 42 in references

Greenfield

Building up new and customized infrastructure, systems, facilities and processes.



Benefits

- Higher design flexibility and efficiency
- Faster integration with the workforce and other operational factors
- Lower maintenance costs

Challenges

- Large capex required
- Complex and time-consuming
- Complicated training requirements for personnel migrating to data-driven systems

Case in point

Audi AG

Invested over €1 billion in a smart factory in Mexico enabling connectivity with central control station to comply with the global production standards

BAE Systems

Collaborated with 40 companies in a €11.2 million concept project to test solutions for deploying 5G in manufacturing

Sources: Please refer #45 and 50 in references

How KPMG can help: KPMG's proven "Value Creation" program has been designed to help you in selecting the best route(s) for implementation of connected machines in processes.

Learn more

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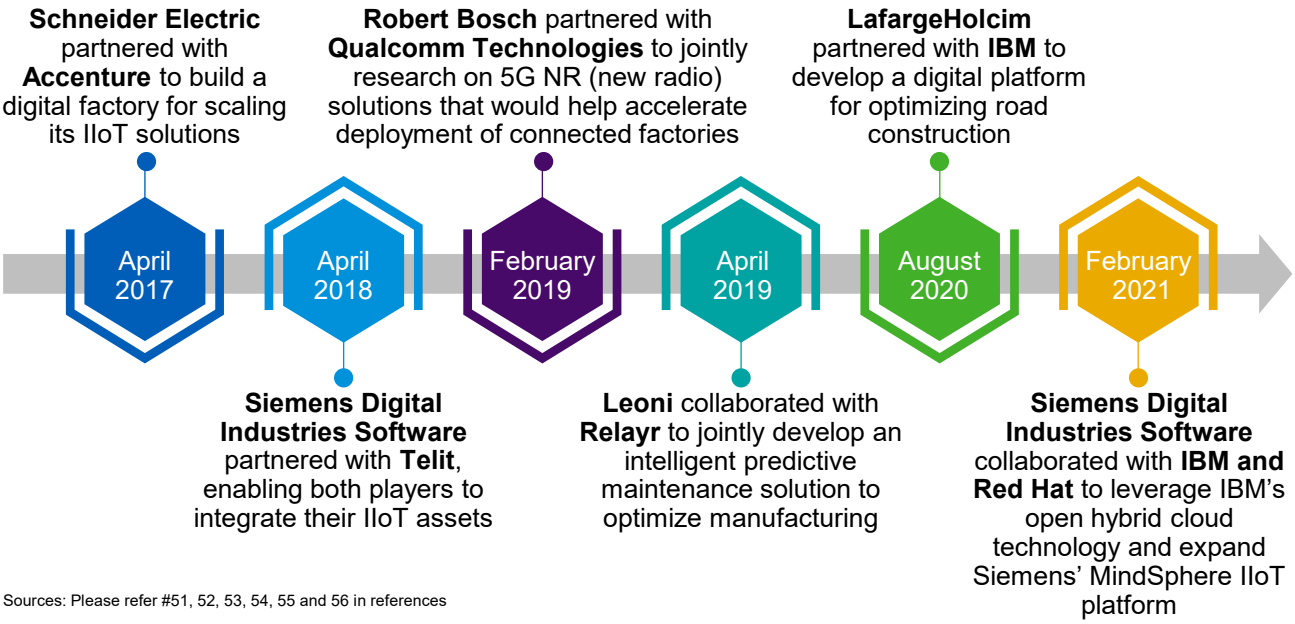
Implement connected machines - which path to take? (2/2)

Leverage various types of collaborations such as strategic alliances, JVs or M&As to attain the desired connected machines capabilities and gradually build operational synergies.

Strategic partnerships[a]

Large industrial conglomerates are forging partnerships with prominent technology players …



Sources: Please refer #51, 52, 53, 54, 55 and 56 in references

Mergers and acquisitions[a]

Rather than investing in R&D for greenfield implementation, large manufacturing companies are acquiring component or technology providers to strengthen connected machine capabilities and improve operations…

Date	Bidder	Target	Target business area	Bidder deal rationale
Apr-2021	Hitachi Rail	Perpetuum	Provider of wireless rail sensors	Optimize railway operations and boost transportation portfolio
Dec-2020	NSK	B&K Vibro	Provider of machine condition monitoring solutions	Expand condition monitoring services portfolio used to enhance machine productivity
Dec-2018	Comelz	Develer	Developer of IT software and hardware solutions	Expedite product development using Develer's AI, Big Data and IoT offerings
Apr-2018	Siemens	Agilion	Developer of wireless location solutions	Bolster real-time location systems (RTLS) for smart factories and logistics

Sources: Please refer #57, 58, 59 and 60 in references

How KPMG can help: For decades, KPMG has supported clients with proven "Buy" and "Partnership" programs to meet this kind of transformation requirements.

Learn more

Notes: (a) Represents an indicative list of partnerships and M&As that were announced between January 2017-July 2021

How shall I pay the bill?

Take advantage of the various financing programs and support mechanisms by federal and state governments across Europe to digitize operations, as well as traditional funding sources.

Why are the EU and Germany promoting digitization in industrial manufacturing?

14%
EU's GDP represented by the manufacturing sector, 2020

29.4 million
People employed in manufacturing in EU-27, Q1 2021

18%
Germany's GDP represented by the manufacturing sector, 2020

€425 billion
Projected value-added potential facilitated by digitization in Germany, 2025

~30%
Projected productivity gains facilitated by digitization in Germany, 2025

Sources: Please refer #63, 64 in references

Key initiatives launched

Governments launched multiple initiatives to boost industrial digitization, across Europe (including EU and the UK).

Some initiatives directly aimed at enhancing digitization

EU's Digital Decade 2030	A **€7.5 billion** program for the deployment of European digital projects
InvestEU	A **€372 billion** funding to foster research, innovation and digitalization over 2021-27
Horizon Europe 2027	A **€100 billion** research and innovation program aimed at cybersecurity, digital economy, climate change, etc.
European Data Strategy 2025	A **€4-6 billion** initiative to fund data infrastructures supporting AI and interconnectivity in IM, among other sectors
Germany Platform Industrie 4.0	A **€200 million** funding by BMWI and BMBF to promote Industry 4.0

Circular economy initiatives that may drive digitization

CE- IoT 2022	A **€1.7 billion** program funded by the EU, for circular economy and IoT in manufacturing and other sectors
EU Green Deal 2030	A **~€1 trillion** program contributing to the advancement of manufacturing to achieve sustainability targets
Germany ProgRess III	A **mandatory progress report** of resource efficiency (via digital transformation) across value chain, to identify and resolve bottlenecks

Sources: Please refer #65,66,67,68,69,70, 71 and 72 in references

Tailored approach for obtaining funding

Different mechanisms may have different pre-requisites, focusing on specific entities (start-ups, SMEs) or specific regions of operation. Companies can also get funded via other routes such as strategic divestments, PE, VC, bank business loans, etc.

How KPMG can help: KPMG can help you explore internal financing options or acquire funds from external sources.

Learn more

I am in a hurry - can I have this thought leadership on 1 page?

In a nutshell:

1. **Connected machines – what is it all about?**
   As a part of Industry 4.0, the connected machine ecosystem comprises devices, software, and intelligent technologies that enable inter-machine communication, resulting in smarter and more agile decisions

2. **Winning or losing millions – why should I implement connected machines?**
   Switching to a connected ecosystem could help increase your customer satisfaction, boost operational efficiency, bring down costs and raise profits, while avoiding falling behind competition, downtimes and losses in productivity

3. **Beyond money – what else does it bring?**
   Connected machines can generate additional revenue streams with profitable business models such as 'outcome-as-a-service', and attain your Sustainable Development Goals (SDGs) with reduced carbon footprint and efficient processes

4. **Which path shall I take to implement connected machines?**
   Facilitate connected machine solutions in factories either via brownfield (upgrading existing systems) or greenfield (building new systems) implementation or via acquiring or forming strategic alliances with connected machine solution providers

5. **How shall I pay the bill?**
   Apart from the traditional funding sources, companies can benefit from the various financing programs and support mechanisms by federal and state governments across Europe to digitize operations

Reach out to KPMG for:

Growth & Portfolio Management
Evaluate growth potential, formulate a clear-cut portfolio strategy, and optimize business portfolio accordingly

Internal and External Financing
Free up cash from annual proceeds or portfolio sales and / or gain access to subsidies, and local financing markets

ESG (KPMG Impact)
Define an ESG strategy, and identify and implement resource efficiency programs

Buy-side / Partnership
Acquire or collaborate with a local player in connected machines space

Turnaround / Value Enhancement
Identify and implement cost reduction / efficiency measures using technology

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