Industry 4.0: Opportunities and challenges

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1st Feb 2017
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Manufacturers need to develop, produce and deliver customized products in a shorter time to optimized cost and defined quality standards.

Defining Industry 4.0

Suppliers → Factory → Customers
Defining Industry 4.0
Defining Industry 4.0

Factory

Internet of Things

Suppliers

Customers
What is IOT?

DATA
(Input)

INTELLIGENCE

ACTION
(Decision or Output)

People

Systems

Apps

Sensors, machines & devices

Applications

Data Sources
The impact of IOT on business models

We see a world moving towards an outcomes-based economy where companies compete on their ability to deliver quantified results. The three key areas of transformation focus on Hardware, Software, Strategy and their integration.

Operational Efficiency
- Asset utilization
- Operational cost reduction
- Improved worker productivity, safety and working conditions

New Product & Services
- New business models
- Pay per use
- Software based services
- Product service hybrid
- Additive Manufacturing

Outcome based
- Pay per outcome (everything as a service)
- New connected ecosystems
- Platform-enabled marketplace
- Industry blurring (digital substitution)
- Circular economy

Immediate to near term
Longer term

Product
Service
Outcome

Image credit: Siemens / Adidas
Digitalisation in the Automotive Industry

Our recent study in conjunction with the SMMT highlighted that the rapid development of the digital economy is changing consumer expectations and old business models are being adapted, changed and even scrapped as a result.

Digital Factory, Demand Driven Supply Chain & Connected Car

- **Demand driven supply chain** – Alignment and sharing of data between vehicle manufacturer and supplier.

- **Digital factory** – Alignment of data between technical disciplines of engineering, production planning, manufacturing, procurement and finance.

- **Connected car** – Sensors and vehicle diagnostics can monitor health of vehicle allowing for new remote vehicle health monitoring service and automation of aftermarket supply chain.
Objectives of the study

1. To inform and advise – policy makers, media, industry stakeholders (vehicle manufacturers and supply chain)
2. Define digitalization as it applies to the UK automotive industry
3. Summarise current status, compare internationally and highlight best practice case studies
4. Summarise future benefits – economics and qualitative assessment
5. Evaluate barriers and constraints to digitalization
6. Make recommendations for policy makers and industry
Economic impact - methodology & results

**Do – Nothing**
- Market assumptions are based on pre-existing forecasts and historic trends
- There is no acceleration in the uptake of digitalization technologies in the future

**Do – Something**
- In this scenario there is a call-to-action and widespread roll out of digitalisation technologies steadily over the next 20 years, which leads to significant impacts on the automotive sector
- Our analysis of the do-something pivots off the do-nothing scenario based on these assumptions
- The overall impact is an increase in GVA of the automotive sector arising from increased output and GVA per vehicle, in addition to other induced benefits
- ‘Spill over’ not considered

Annual total economic benefit by 2035
£8.6 billion

- £4.3 billion of which relates to vehicle manufacturers
- £2.6 billion to suppliers
- £1.7 billion and relates to the wider economy

Cumulative total economic benefit by 2035
£74 billion
Use cases

Digitalisation applications often involve the creation of a “digital twin” of a physical product, manufacturing process, factory or supply chain. Changes can be made easily in digital form allowing for the simulation of different scenarios:

- Design production lines
- Estimate the manufacturing cost and time of a new model
- Optimize throughput by identifying waste and removing bottlenecks
- Eliminate defects through root-cause analysis of production data
- Predict and plan plant maintenance
- Reschedule production and suppliers in response to changing customer demand and to better respond in a crises (such as product recall or supply chain disruption)
Challenges facing manufacturers

Top 10 barriers to embracing connected, digital business models

1. Lack of Skills and Knowledge
2. Intellectual Property (IP) leakage
3. Data Format Discontinuities
4. Cyber Attack
5. Network Interruptions
6. Managing People & Change
7. Cultural Resistance
8. Benefits unclear and hard to measure
9. Funding for Investment and R&D
10. Lack of agility & long product life cycles
## Recommendations

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<thead>
<tr>
<th>Skills</th>
<th>Key new roles identified in our study include 1) Data scientists 2) Data engineers 3) Data architects 4) Development operations 5) Cyber Security Engineers</th>
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<tbody>
<tr>
<td>Digital infrastructure</td>
<td>Rollout of reliable, high speed internet connections through broadband, 4G and, in future, 5G technologies</td>
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<td>Demonstrator &amp; clustering</td>
<td>Underpin and extend UK demonstrators (e.g. Factory 2050, MTC, DETC etc) with greater local demonstration sites and access to associated technologies</td>
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<td>Digital Standards</td>
<td>Data sharing between different companies is a critical part of digitalisation. This can be facilitated by the development of digital standards across industries</td>
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<td>Cyber Security</td>
<td>Companies need to develop a ‘bottom-up’ methodology for assessing cyber threat use cases and then develop a cyber security strategy in response to significant threats</td>
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<td>Financing &amp; Investment</td>
<td>Further cost:benefit studies needed to validate benefits. SMEs, in particular, may struggle to secure the financial backing needed to take full advantage of digitalisation</td>
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Where are you on the journey?

Our global maturity assessment is a basis for defining a company's position on its journey to a complete implementation of Industry 4.0’s design principles.
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