Connected products and the future of digitally-enabled business models

How servitization can create sustainable and resilient business models by capturing new value from product data and advanced analytics.

orange™ **Business Services**

THE **ADVANCED SERVICES** GROUP

A joint white paper from Orange Business Services and The Advanced Services Group

Contents

Foreword

We're entering a new era in which virtually everything and everyone is becoming connected, enabled by rapid advances in 5G, the Internet of Things (IoT), artificial intelligence (AI), and multi-cloud and edge computing.

This enables an increasing number of firms to adopt a "servitization" strategy in sectors ranging from transport to healthcare and industrial machinery to mining. According to the Advanced Services Group at Aston Business School, servitization is "the innovation of an organization's capabilities and processes to deliver services rather than products alone".[1]

In the past, firms used to focus on designing great products to achieve competitive differentiation and customer loyalty. The customer would buy those products, and that would be it.

Increasingly, it's the positive experiences a firm can create for its customers through its connected products and processes that are the source of value. Companies learn about when and how customers use their products, what defines a good experience, and when to deliver supplies or maintenance services. They can coach customers in their day-to-day usage of their products, helping them to save money, time and reduce their environmental impact.

This "servitization" trend involves a radical transformation of business models and ecosystems. We are moving to "pay-per-use subscription models" where customers do not pay for a product but the business outcomes it delivers. Digital platforms are an essential enabler of services offerings, enabling us to integrate and automate diverse internal and external cross-functional teams, technologies and workflows. However, a focus on technology alone is not the route to commercial success. It's only through a customer-centric, services-led business model that firms can exploit the opportunities that digital platforms and data from smart connected products provide.

This is why Orange Business Services is working with a highly specialized business school – the Advanced Services Group (ASG) at Aston University – to bring you the latest thinking on digital business model design and data monetization strategies. Based on ASG's experiences with major brands, this report shows that enterprises can reduce risk while boosting customer satisfaction levels, revenues, and margins through servitization.

At a time of rapid change, where digital services delivery is the new competitive battleground, getting your digital business model and data monetization strategy right has never been more critical.

Laurent Godicheau
Chief Strategy Officer
Orange Business Services

The Advanced Services Group (ASG) at Aston University has worked for over 15 years to advance the servitization strategies of major brands around the world, such as Goodyear, Tetra Pak, Thales, Omron, Legrand, BDR Thermea UK & Ireland and Domino Printing Sciences, some of which are featured in this report, alongside some of Orange Business Services' many customers in this area, such as GHD and Kone.

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1   Baines et al, State-of-the-art in product-service systems, The Journal of Engineering Manufacture, 2007

1. Introduction – Trends affecting industry

The manufacturing and high-tech sectors are experiencing one of the most challenging and exciting periods in their history. Even before the global impact of 2020's pandemic, there was a growing recognition of the need for change and modernization.

Commoditization

Products are becoming commoditized due to the ease with which new features can be copied without infringing on patents. According to a review of over 50 case studies over the period 2009-2017 by the Harvard Business School, it is enabled by easy access to cloud-based computer-aided design and simulation tools.[2] Inevitably, this means competition becomes a race to the bottom, in other words, which product has all the necessary features at the lowest cost. In this type of competitive environment, innovation is secondary to squeezing costs out of production processes. For many businesses, this is not a financially sustainable strategy.

Competition from disruptors

Companies also face rapidly-growing competition from new disruptors. These include the global tech firms capitalizing on their position in value networks that rely increasingly on data. For example, initiatives like Amazon's Alexa, Waymo's autonomous vehicles (which started out as the Google self-driving car) and Apple's "Titan" electric vehicle project are developing rapidly. These companies have set a precedent and brought a new awareness of the potential of data to deliver better business outcomes. They are deploying data, artificial intelligence, and learning to produce autonomous vehicles that will make travel easier, more comfortable, and potentially much safer. The challenge now is for the more traditional industries to respond.

Need for business innovation

Innovation in industry is crucial in delivering on national and international targets to tackle greenhouse gas emissions. Businesses are now expected to reduce their carbon footprint, and in some cases, entire product ranges. For example, internal combustion engine cars and domestic gas boilers will become outlawed in many countries. The challenge is developing innovative business models and offerings that exploit existing expertise and knowledge and deliver the more environmentally-friendly solutions required.

Enterprises need to keep up with changing customer needs and expectations. The boundaries and differences between our expectations as consumers (B2C) and business customers (B2B) are reducing. Business customers increasingly expect to be provided with solutions that make their lives easier, enabling them to focus on their core goals, much as we have become used to in our consumer lives. In this context, Amazon, which has provided a benchmark in consumer customer service, has started to extend its sales to businesses. Traditional B2B suppliers will have to improve their own capabilities to service their traditional customers or risk losing them.

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2   sloanreview.mit.edu/article/why-high-tech-commoditization-is-accelerating/

Digital services on the growth curve

While international trade in services such as travel, recreation and legal advice took a hit in 2020, the same can't be said for digitally-enabled services. According to the World Trade Organization, international trade in services declined by 24% in the third quarter of 2020 compared to 2019. "Computer services" were the notable exception to the trend, with a 9% year-on-year increase due to increasing global demand for cloud computing, platforms and virtual workplaces. This compares favorably to trade in physical goods, which was down by 5% over the same period.[3]

Connected devices

As consumer and business demand grew, many companies experienced significant uptake in connected products and remote field service and diagnostics. McKinsey reported a seven-year increase in the rate of development of digital and smart connected products and services in 2020.[4] This trend is set to continue. For example, the global market for remote vehicle diagnostics is forecast to grow by a 16.6% compound annual growth rate from 2020 to 2027, to reach a value of US$54.5bn.[5]

Already, there are more connected devices than people in the world. According to IDC, by 2025, 41.6 billion devices will be capturing data on how we live, work, move through our cities, and operate and maintain the machines we depend on.[6]

Careful, meaningful exploitation of the data they generate is a critical factor in gaining and maintaining competitive advantage and that those who don't do this will be left behind. However, knowing which digital innovations to adopt, where and how, in order to enable business growth, is a challenge.

3   to.org/english/news_e/news21_e/serv_26jan21_e.htm

4   ckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever

5   researchandmarkets.com/reports/4805380/remote-diagnostics-global-market-trajectory-and?utm_source=dynamic&utm_medium=GNOM&utm_code=jbbsgk&utm_campaign=1406812+-+Remote+Diagnostics+Market+Expected+to+Grow+by+%2438.8+Billion+During+2020-2027+(COVID-19+Adjusted+Forecast)&utm_exec=joca220gnomd

6   IDC, The Growth in Connected IoT Devices Is Expected to Generate 79.4ZB of Data in 2025, According to a New IDC Forecast, June 2019, https://www.idc.com/getdoc.jsp?containerId=prUS45213219 (link as of 7/9/20). Quoted in http://www3.weforum.org/docs/WEF_The_State_of_the_Connected_World_2020.pdf

2. Rethinking business models with servitization

Clearly, industry needs to rethink its business models to respond to and capitalize on these trends. The key to this transition is creating digitally-enabled, services-led business models that use the data created by connected devices. Service-focused business models allow manufacturers to differentiate from product-focused business models that force firms to compete purely on price.

Manufacturers need to ensure that the value from the digitalization of manufacturing machinery is captured by those who create the machines rather than by big technology firms who integrate and derive insights from diverse machine data. Manufacturers need to adopt digital technologies to securely collect, transport, store, process, and analyze data to win this race. This will help them create new business models, and share key insights with external and internal partners to deliver new types of service.

Building differentiation

A services-based business model places the product – and the expertise in how to operate and innovate with it – at the core of the offering. This clearly provides a way to compete or collaborate with the data giants. The adoption of these business models, and the organizational transformation required to deliver them, is known as servitization. We describe servitization as "The innovation of an organization's capabilities and processes to deliver services rather than products alone".[7]

Competitive advantage

Servitization provides an opportunity for manufacturers to capture the value of their digitalization effort. They can develop long-term relationships with their customers, create internal efficiencies and be responsive to business needs. It provides an opportunity to further use their product expertise beyond just the creation of the product, for example, applying predictive maintenance to boost uptime.

What is servitization?

For a manufacturer, servitization means becoming more focused on the business outcomes that your product or service enables. For example, Xerox Business Services provides document management services supported by document management software, connected products and cloud storage to improve the recording and visibility of patients' medical history, helping medical professionals to be more efficient and effective, improving the patient experience and also supporting regulatory compliance with clear documentation of treatments given.[8] Firms can sell to the customer the peace of mind that the business outcome (e.g. document management) will be delivered, meaning that organizations can focus on being more successful in their core business while also benefitting from improvements, such as more predictable expenditure and easier regulatory compliance.

Digitalization without creating these advanced services risks that manufacturers forgo the capturing of the value that the data creates. Instead, their product will remain a data capture device for those companies that can generate huge value from such data.

Delivering value to customers

Services place the user experience and the outcome that the customer wants to achieve at the heart of the offering. They enable companies to start to meet changing customer expectations and build customer loyalty. This can be achieved by freeing up the customer to dedicate more time and resources to their core activities, or enabling them to deliver new or improved offerings and value propositions.

For example, the CEO of UK rail operator Virgin Trains credited its services contract with manufacturer Alstom Trains for going consistently "beyond the call of duty to help us achieve the performance that has attracted record customer numbers and customer satisfaction scores".[9]

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7   Baines et al, State-of-the-art in product-service systems, The Journal of Engineering Manufacture, 2007

8   xerox.co.uk/en-gb/services/healthcare-solutions/memorial-medical-center-case-study

9   alstom.com/press-releases-news/2010/9/alstom-and-virgin-trains-launch-co-branded-alstom-pendolino-a-train-with-a-mission-

Improving sustainability

A servitized offering usually involves taking responsibility for the maintenance, uptime and disposal of the product. This incentivizes the manufacturer to use as few materials as possible in their creation and re-purpose products at the end of their life. These new circular economy business models provide opportunities for differentiation and can increase customer loyalty and brand reputation. In addition, servitization can lead to rapid introduction of more energy-efficient innovations. It also provides opportunities to innovate and gain market acceptance for new technologies driven by environmental legislation.

For example, in the UK, domestic gas-powered water boilers for heating will be outlawed in new build homes from 2025. Boiler manufacturer Baxi Heating is innovating a digitally-enabled "Heat-as-a-Service" offering. This allows them to deploy new technologies that homeowners consider prohibitively expensive to provide a more environmentally sustainable heating solution without the cost or uncertainty of new technology ownership.

Another example is the rapid growth in "Mobility-as-a-Service" offerings, driven by drastic changes in the way consumers, regulators and city planners think about urban transport, including a strong emphasis by legislators on electrification and carbon neutrality.[10]

Increasing manufacturing business resilience

Services business models can also significantly improve business resilience for the manufacturer. They are usually accompanied by multi-year contracts with a predictable, recurring revenue stream. This also increases customer intimacy and provides opportunities to build loyalty.

Aero-engine firm Rolls-Royce is one of the most well-known manufacturing companies to compete through services-led business models, typically generating over 50% of its revenue from services. Since the 1980s, it has used cutting-edge technical and digital capabilities, along with engineering expertise, to provide total lifecycle management solutions on aircraft engines, such as its flagship TotalCare offering.

In 2020, international passenger demand was 75% below 2019 levels according to IATA (the International Air Transport Association) and revenues at airlines around the world fell dramatically.[11] Despite this, Rolls Royce's services business, particularly TotalCare, has recovered relatively quickly.

While customers cut costs by canceling new aircraft and engine product orders, they still needed to fly, albeit not at the same rate as usual. Those aircraft covered by Rolls-Royce TotalCare are the newest, most energy-efficient and most adaptable to different load types. They have a minimum run-time cost built into their contracts, so customers chose to fly these aircraft, and Rolls-Royce has continued to generate services revenues. Services have been the most resilient part of the business and will drive its recovery.[12]

10 The Mobility Blockchain Platform: A blueprint for the future of mobility. Orange Business Services, Ciklum and bloXmove

11 iata.org/en/pressroom/pr/2021-02-03-02/

12 Services Resilience: A Case Study of Rolls-Royce Aerospace, The Advanced Services Group

Figure 1: Benefits of a servitization business model

Challenge	Benefits of services business models
Competition from low-cost providers and big data companies	Differentiation Exploitation of product expertise
Environmental objectives	Reduction in materials use and emissions in processes and product use Opportunities to introduce new technologies
Increasing customer expectations based on consumer experiences	Provides an outcome to customers that meets their needs and wants
Business resilience	Recurring revenue, long term contracts and customer loyalty
Value capture from digitalization	Provides clear framework to develop the digital architecture, supporting a differentiated value proposition

3. The components of a services business model

A services business model defines the way in which a firm creates, delivers and captures value versus its competitors.

It has four components, as shown in **Figure 2**.

In order to envision and execute a services-led business model, the starting point has to be developing the customer value proposition by understanding the customer or customers' needs and business problems.

A service that doesn't have a reasoned, researched and evidenced value proposition is a solution looking for a problem that may not exist. Even if the problem is clear, without a well-researched value proposition, a competitor will likely have come up with a better solution that meets the customer's requirements more closely.

Developing a services value proposition

Developing a services value proposition requires in-depth work to understand customer needs, problems and opportunities for growth (the "pains and gains"). In the old business model, conversations with the customer about their needs might have gone no further than discussing product features and repair. Now a services value proposition needs to be co-designed with the customer, and it requires a level of understanding that cannot be gained through direct questions and answers alone.

Innovators need to be able to get "into the customer's shoes". This will allow them to work out what the potential customer of a new product or service thinks, hears, tells and feels about upcoming or existing solutions for its needs.[13] They will also need evidential historical data about how the product is used and operated, how it fails and how it responds to interventions.

To get this, they need to collect, store and analyze this data, see emerging trends and interpret how these relate to opportunities to design new services. Only then can they plan how their expertise and product(s) can better support the customer.

Figure 2: The structure of a digitally-enabled services business model

THE CUSTOMER VALUE PROPOSITION
What you will do for the customer and the outcome they will get

THE VALUE CREATION AND DELIVERY SYSTEM
How you will do it, and the resources and processes needed

THE VALUE CAPTURE PROCESS
How you will get the benefit from what you do

COMPETITIVE ADVANTAGE
Why you will be better than your competitors at doing what you propose

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13 Baines, T.S., Ziaee Bigdeli, A., Anders, K.M., Andrews, D., Benbow, S.A., Kapoor, K., Machan, I.H. and Tumber, N. (2019) Customer value propositions for servitization: A mini-guide for manufacturers seeking to compete through advanced services. Birmingham, UK; The Advanced Services Group, Aston Business School.

CASE STUDY – GHD

GHD is a global professional services company with engineering, construction and architectural expertise. It employs over 10,000 people across five continents – Asia, Australia, Europe, North and South America, and the Pacific region.

The company created a Digital division to help clients with their digital transformation. It combines the company's experience in the delivery of engineering, architecture and environmental and construction services with its understanding, knowledge and capability in areas such as innovation, digital intelligence, cybersecurity, smart precincts and digital strategy.

GHD Digital recently launched a digitally-enabled risk management service for tailings dams. These are dams used by mining companies to store the by-products of the mining process which are usually highly toxic and potentially radioactive. The development of industrial IoT and AI has created the opportunity to gather data, distribute insights and automate responses in ways that have been previously unsustainable in natural resource mining, especially in the context of the complex storage and management of tailings.

The solution uses IoT sensors to collect and disseminate key data, such as dam wall deformation or movement and water table levels. This is integrated with third-party data, such as meteorological information, and analyzed to provide real time information, visualization and reporting. It also issues alerts where measurements and indicators move outside of set parameters. These insights and alerts enable customers to manage risk and take action.

GHD also offers a complete management service where it will take on responsibility for maintenance and repair of the dam, allowing the customer to focus on its mining operations. By combining expertise in engineering with the insight gained from data analytics, GHD can significantly reduce the overall risk of dam failure, a benefit not only to the mining company but to all living and working near the mine. GHD assumes the role of 'Engineer of Record' for the dam, and the associated legal responsibility and liability for ensuring it does not fail. The insights generated from data and the improvements in dam management practices that they enable are critical to de-risking this high-value offering for GHD.

Source: 'Revolutionize your tailings risk management and responsiveness' e-book, Orange Business Services and GHD Digital

CASE STUDY – KONE

KONE is an international engineering and services company specializing in elevators, escalators, autowalks and automatic doors. It employs over 60,000 people worldwide, operates in more than 60 countries and serves more than 550,000 customers[1]. Its customers are builders, developers, building owners, facilities managers, designers and architects, but any member of the public might use its products. By 2016 over one billion people used KONE elevators and escalators each day[2].

KONE uses data to provide a range of maintenance and people-flow solutions to customers. Its core solution is the connection of all lifts, escalators and building doors to a digital platform, to provide data-enabled maintenance and modernization services and improve equipment performance, reliability and safety. Usage statistics, fault codes and key parameters are captured and transmitted in real-time to KONE's cloud service, where they are analyzed. If a problem is identified, this is flagged to the technical support or customer service team, and if necessary, a technician is proactively dispatched to take action[3].

KONE's People Flow Planning and Consulting services build on KONE's established capabilities in gathering and analyzing data on in-building traffic patterns. The service provides mapping and modelling of people flow and potential areas of congestion. This enables customers to make changes that will minimize waiting times and make buildings more functional and adaptable for future traffic needs. Recommendations can be made, for example, to improve building layout, change placement of entrances, and which solutions to install.

Source:
1 KONE 2020 Annual Report https://www.kone.com/annual-report/en/kone-2020-12-31/reports/kone-2020-12-31.html
2 Kone company history https://www.kone.com/en/company/history/
3 KONE case study, The Advanced Services Group, https://www.advancedservicesgroup.co.uk/kone-case-study-download

The types of services-based customer value propositions

Services income has traditionally been generated through the provision of spare parts, repairs and overhaul. Now servitization allows businesses and consumers to buy more complex services that ultimately deliver outcomes or "capabilities". For example, rather than buying an engine, airline customers want to buy "thrust", and rather than buying a vehicle, logistics companies want "mobility".

De-risking product ownership

Customers want to buy a service that de-risks or removes product ownership and enables them to focus on their core business. **Figure 3** illustrates the concept of a services staircase, whereby companies can evolve their services offerings, building from one to the next. The higher up the staircase, the more risk and responsibility the provider takes on.

This evolution makes manufacturers' services more attractive and ultimately captures more value (with revenues at a higher margin). For example, in the elevator industry, companies such as Otis and KONE have maintenance service margins of 25–35% compared with a margin of approximately 10% for the sale of new equipment alone.[14]

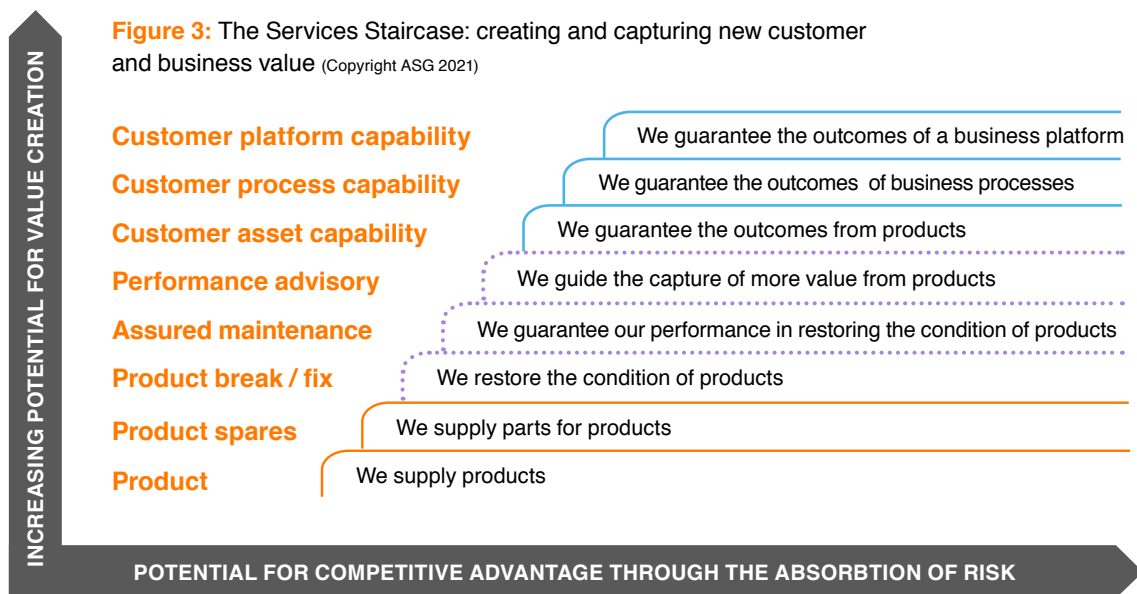Digitalization helps them to manage this risk.

Focus on business outcomes

Customers are increasingly asking for services that deliver capability and outcomes. Assured maintenance and performance advisory are often an entry point into operating digitally-enabled services business models. This is where the provider uses digital technologies to gain insight into how customers use its products and offers data and/or intelligence to that customer on how to gain more value from those products.[15]

However, the demand for services that offer capabilities is growing as products and business environments become ever more complex.

Customers are increasingly unlikely to pay for data or advice alone. They expect this as a "given" as it is becoming so readily available. What they want to buy is peace of mind and a capability that lets them focus on their core business.

Even proficiencies such as predictive maintenance, enabled by data, may not be an attractive value proposition on their own. The customer increasingly wants to see maintenance as the provider's responsibility – they just want to know the product will deliver. Predictive maintenance becomes an enabler of a capability-based value proposition, not an offering in its own right.

Figure 3: The Services Staircase: creating and capturing new customer and business value (Copyright ASG 2021)

INCREASING POTENTIAL FOR VALUE CREATION

- **Customer platform capability** — We guarantee the outcomes of a business platform
- **Customer process capability** — We guarantee the outcomes of business processes
- **Customer asset capability** — We guarantee the outcomes from products
- **Performance advisory** — We guide the capture of more value from products
- **Assured maintenance** — We guarantee our performance in restoring the condition of products
- **Product break / fix** — We restore the condition of products
- **Product spares** — We supply parts for products
- **Product** — We supply products

POTENTIAL FOR COMPETITIVE ADVANTAGE THROUGH THE ABSORBTION OF RISK

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14 'The lift business: Top floor, please'. The Economist. 16th March 2013. https://www.economist.com/business/2013/03/16/top-floor-please

15 The Advanced Services Group (2018) Performance Advisory Services: A pathway to creating value through digital technologies and servitization. Birmingham, UK; The Advanced Services Group, Aston Business School.

CASE STUDY – TETRA PAK

Tetra Pak is one of three companies in the Tetra Laval Group, a private group originating in Sweden, and today is headquartered in Switzerland. Tetra Pak's heritage is in providing processing and packaging technologies for the food industry.

Tetra Pak Plant Secure adds value by focusing on the entire plant and drives productivity and quality improvement that meet a customer's goals. It covers all production related equipment, regardless of manufacturer or function, that guarantees overall operational efficiency of a plant.

Tetra Pak assumes responsibility for maintaining the entire plant, including technical operations, staffing, maintenance, climate control, building structure and utilities, all of which have significant effects on the performance of the factory. Tetra Pak guarantees operational cost and factory output (with a risk and benefit sharing agreement)[1] and customers pay on the basis of the output (e.g. a price for a filled sealed package). This de-risks the customer's business, because it knows how much a filled pack at the gate will cost them and what margin it will make.

Tetra Pak leverages the insights derived from data gathered by monitoring its global installed base of over 5,000 production lines. This allows it to benchmark customer performance against others in the industry and enable successful delivery of the service[2]. Connected products inside the customer's operations provide data on operational performance and these insights are compared with future business needs to identify gaps and priorities[1].

Source:

1. https://www.tetrapak.com/content/dam/tetrapak/publicweb/gb/en/services/documents/technical-paper-frontiers-of-productivity.pdf
2. https://www.tetrapak.com/en-gb/solutions/services/service-portfolio/plantsecure

CASE STUDY – ALSTOM

Alstom is a French multinational company operating worldwide in rail transport. It operates in 70 countries and employs 26,000 people. In the UK, one third of all daily passenger rail journeys are made on Alstom trains, in addition to one million daily journeys on the London Underground.

Alstom aligns its focus with the priorities of its rail operator customers, which are centered on the passenger experience. Through whole-life services Alstom creates significant additional value for rail operators by understanding in detail their business needs and ensuring the KPIs in its contracts relate directly to passenger satisfaction. These can include the availability of catering, and toilets being in working order, in addition to the train having no technical faults that cause it not to run on time. Ultimately, it is this passenger satisfaction that helps the rail operators to develop and maintain their position in the market, to sell more tickets and to grow their businesses.

In order to deliver a contract like this, Alstom has invested heavily in digital technology and facilities. It installed basic telematics onto trains twenty years ago and has invested millions into R&D for digital since. For example, its TrainTracer technology provides real-time condition monitoring and identifies problems before they occur. Alstom built or acquired a number of trackside maintenance facilities in order that technicians can be as close as possible to where the trains are used. This can prevent problems by acting as quickly as possible, using the insights gathered from condition monitoring.

The data gathered enables a close relationship with customers and an intimate knowledge of their business. It is also used to inform product design, to ensure assets are as easy to service as possible. This reduces maintenance costs for Alstom and also makes it easier to meet its contractual commitments in terms of asset availability.

Source:
Alstom Case Study, The Advanced Services Group https://www.advancedservicesgroup.co.uk/alstom-case-study-download

4. Digital innovation at the heart of servitization

The speed of digital innovation and the range of technologies made available in recent years can be confusing and overwhelming. All forward-thinking businesses recognize that digitalization will transform their industry, but there can be a lot of noise about new trends and technologies, often without consideration of the business model that they enable.

For example, it is pointless capturing a vast amount of data from IoT devices without a clear strategy to monetize it. Ultimately, new digital technology alone will not deliver growth and new revenue streams. Digital technologies need to be seen as a vital part of the value creation and delivery system, and a critical enabler and de-risker of servitization.

Central role of data collection

Servitization allows manufacturers to guarantee product performance, enable increased value capture or deliver guaranteed outcomes. To achieve this, they will need to collect significant amounts of data on the product, its operation and, in some cases, the environment and process in which it is operating. The customer value proposition guides the requirements for this data. It informs the parameters that need to be measured and monitored, how this data needs to be stored, for how long and what the analysis of the data needs to demonstrate.

Data provides manufacturers with the ability to ensure that servitization is provided efficiently and manage the risk they have taken on. For example, product-use data is critical for the manufacturer to effectively carry out its repair commitments and fulfill the product-uptime commitments. These typically form part of the servitization value proposition.

In addition, data, analytical insights and remote access to the product are essential for a remote root cause analysis and to make use of remote repair opportunities. Even if a physical repair is required, the analytical insights are critical to optimize the repair preparation (and minimize risk of return visit), increase the speed of repair and reduce the cost of repair overall.

Analytics to optimize operations

Data and analytical insights are critical for manufacturers to optimize the reactive or preventative repair process. For example, they can help avoid second visits by giving information on the exact nature of the repair and parts needed before an engineer travels to site. They also form part of the routine maintenance regime to help avoid repairs and breakdowns in the first place. Contemporary maintenance regimes are either generic or based on crude use parameters (i.e. hours of operations) with limited considerations of the actual state of the product.

AI and machine learning

The application of AI and machine learning provides an opportunity to move away from relying on these crude parameters. They help to develop the required fine-grained understanding of the range of parameters (and their interaction) that affect the ideal time of maintenance. Embedded machine learning applications can continuously analyze the product use data and identify when maintenance is required without sending large amounts of raw data and putting a strain on the network.

The identification of the ideal maintenance regime will reduce redundant maintenance activities and the risk of failure. In a servitization context, where the manufacturer is responsible for maintenance and uptime, the ability to reduce the maintenance cost while also reducing the risk of failure (unplanned downtime) is critical.

Determining future requirements

Data and analytics also enable manufacturers to optimize their consumables and spare parts replenishment supply chains and warehousing costs in light of known rates of usage and wear. The detailed insights into the customer's use of the product provide higher levels of certainty on future requirements.
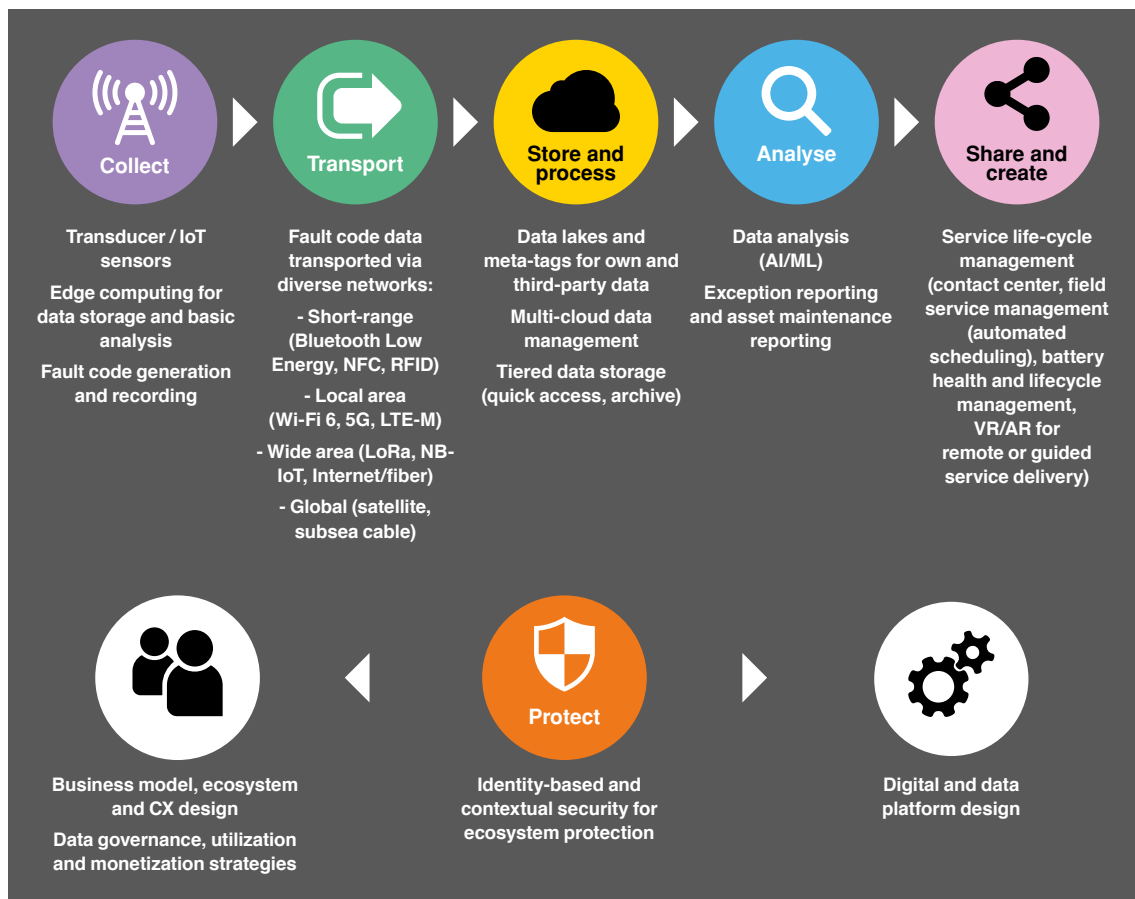
In cases where products require detailed quality checks and record-keeping for health and safety or regulatory reasons (e.g. transport, medical), manufacturers can go one step further. They can use the data to take on some of the customer's administrative burden associated with product ownership, as part of their servitization value proposition.

For example, "MAN ServiceCare" was created by the UK haulage truck manufacturer MAN to provide proactive, digital management and preventive planning for fleet maintenance. Customers have an overview of vehicle status and condition at all times and MAN contacts the customer to arrange urgent maintenance or repair.[16]

Another further example is Michelin acquiring telematics company Masternaut to provide fleet management solutions, including driver management tools and a fleet management platform. It can perform business reviews with smart reports and action plans that enable customers to run efficient and sustainable fleet operations.[17]

Figure 4: The data flow process

Collect

Transducer / IoT sensors

Edge computing for data storage and basic analysis

Fault code generation and recording

Transport

Fault code data transported via diverse networks:

- Short-range (Bluetooth Low Energy, NFC, RFID)

- Local area (Wi-Fi 6, 5G, LTE-M)

- Wide area (LoRa, NB-IoT, Internet/fiber)

- Global (satellite, subsea cable)

Store and process

Data lakes and meta-tags for own and third-party data

Multi-cloud data management

Tiered data storage (quick access, archive)

Analyse

Data analysis (AI/ML)

Exception reporting and asset maintenance reporting

Share and create

Service life-cycle management (contact center, field service management (automated scheduling), battery health and lifecycle management, VR/AR for remote or guided service delivery)

Business model, ecosystem and CX design

Data governance, utilization and monetization strategies

Protect

Identity-based and contextual security for ecosystem protection

Digital and data platform design

16 man.eu/uk/en/digital/truck-services/digital-services-for-trucks.html

17 masternaut.com/all-solutions/fleet-management-approach/ accessed 16 June 2021

De-risking service models

Data de-risks services business models by giving the provider visibility of the product and prior warning of factors that may cause service interruption. It can also alert the manufacturer to any misuse of the product or changes to its environment.

Customers can also de-risk their adoption of new technologies as they have the assurance that the manufacturer will be fully accountable for any bedding-in issues via outcome guarantees. In this way, digitally-enabled services are driving the adoption of cleaner technologies, such as electric vehicles and new technologies in heating and cooling buildings.

Using data in product development

Data can also inform the design or re-design of products that best support the services offering, a process called Engineering Design for Service. When a product is designed specifically to enable the delivery of a service, the design process needs to incorporate how easily the product can be maintained, repaired, upgraded and recycled. The costs to the product provider include its whole lifecycle, and the product needs to be designed to minimize these.[18]

Data relating to past performance, and in particular faults, repair and maintenance are needed. How reliable are the product and its components? How often does it need to be repaired? How easy is it to repair and maintain? Developers must set parameters to capture, transmit, store and analyze the relevant data that will answer these questions and enable designers to design or modify products accordingly. Finally, the whole process needs to be underpinned by adequate security to protect against malicious attacks.

16 Andrews, D., Harrison, A. and Machan, I. Engineering Design for Services: How to Ensure that Products are Designed to Support Servitization. Birmingham, UK; The Advanced Services Group, Aston Business School.

5. Overcoming common challenges

The opportunity that data provides to servitization design and delivery is clear. However, there are substantial challenges to capture these opportunities and develop a data strategy that supports servitization delivery in the long-term.

Getting the right data

Today's sensor technology provides a de facto unlimited range of possible data in relation to the use of the product. The challenge is identifying the kind of data that effectively supports the manufacturer in designing and delivering their advanced services. Depending on the nature of the product, this decision may have long-lasting implications.

For products with a long lifespan, the range of sensors fitted may determine (and limit) the range of data that can be used in the foreseeable future. Retrofitting sensors to capture additional data at a later stage is expensive and, for some products, is not feasible or a good return on cost.

Feeding into product design

Data and analytical insights are critical for the design and delivery of advanced services. Therefore, the choices made in the product's design should be guided by the future servitization value proposition and its required data strategy.

Unfortunately, these future business opportunities frequently do not feed into the design stage, and manufacturers miss out on capturing them due to the design choices they made in the past. Often, these decisions are driven by cost alone instead of considerations of future service needs and the long-term value the data resource could generate. From a servitization point of view, the connected product serves as a platform for service delivery and as a data capture device that enables future learning and optimization.

Getting access to the right amount of data

The value of the data and the insights gained through its analysis are, to some extent, impacted by the amount of data captured and the different scenarios it shows. The ability to gain insights on how a particular "usage scenario" impacts the product's failure rate requires substantial (often longitudinal) data.

These insights enable the manufacturer to understand the particular implications, risks and commitments that servitization creates. The manufacturer needs to have substantial data to understand the risks and implications of their offering to inform pricing and feasibility considerations.

However, getting access to this critical use data requires careful considerations. Data access and data ownership considerations form important parts of any servitization data strategy and contract. Without a contract, customers are likely to expect additional value in exchange for the data. As the servitization customer base extends and the breadth of the data resource grows, the manufacturer will obtain more certainty about its products and the feasibility of the value proposition.

Changing business practices to utilize the data

The ability to utilize the data resource for advanced services is not only dependent on deploying the technical solutions and obtaining access to product use data, it also requires significant changes in business practices. For example, when it comes to product design, service leaders need to have significant input, and the short-term and long-term service-related insights required should drive the choices of sensors and connectivity at this stage.

It may be necessary to set up interventions to obtain insights into product behavior under different scenarios. For example, a maintenance regime used consistently across all products provides limited insights into its actual effectiveness. Shortening or lengthening the intervals may or may not increase the risk of failure, but will reduce or create cost for the manufacturer responsible for maintenance and repair.

It's important to test and refine assumptions systematically. Online businesses regularly engage in A/B testing to experiment with their customer base. For example, they adapt the visual design and layout of web pages or emails for different sub-groups to observe the impact. This is a practice that manufacturers need to adopt to refine their offering and understanding continuously.

6. Final considerations in your servitization journey

When planning your digital business model and data strategy, consider these four key points:

1 What insight will be needed in the future? What data do you need to be collecting now to enable future business models?

2 What customer, cross-industry, and third-party data will you accumulate over time? What is your data governance strategy? How will you manage the risk of malicious attacks and mitigate for technological non-reliability?

3 You need a trusted provider for data, but you need to know what you need from the partnership in order to buy the right thing.

4 Your digital strategy needs to be aligned with and informed by a long-term business model strategy. This should inform the creation of infrastructure such as the right digital and data platforms to enable the services offering and the creation of value. In addition, consider how artificial intelligence and machine learning will be harnessed and incorporated to support the business model.

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Eleanor has worked for ten years supporting product-led businesses to adopt services. She manages business partnerships and communities, most notably the Advanced Services Partnership, a network of like-minded senior executives from global manufacturing businesses. She has authored and co-authored whitepapers, extended case studies and research papers on the topic of servitization.

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THE ADVANCED SERVICES GROUP

The Advanced Services Group is a center of excellence at Aston Business School, Aston University in the UK. It provides education, training, research and a global network of like-minded professionals around advanced services and servitization. Its work helps global manufacturers and technology innovators to develop services-led strategies.