Using benchmarking analytics and the huge quantities of data produced by just a single factory, manufacturers can identify the 'golden moments' where one product can be produced for half the energy or CO_2 emissions of the same product manufactured at a different time. Alternatively, the same data can be used for anonymous comparison between factories. One study estimated that this would yield up to £10 billion extra profit for UK manufacturing by lowering material, energy and utility costs, while simultaneously delivering a 4.5 percent CO_2 reduction for the UK. This kind of 'win-win' opportunity exists if we can rise to the technical challenge of unravelling large and complex sets of data to make sensible comparisons.

IntelliSense (see case study below) is doing just that for the natural resources and mining industry. The company is using AI, the IoT and analytics to identify target energy savings and deliver resource productivity gains for its customers worldwide, while creating new jobs and companies in the UK.

Augmented Reality (AR) is an important part of the drive for productivity. It enables, for example, engineers to see energy, water and waste flows in real time in the factory setting. Engineers can thus bring their traditional skills of productivity improvement to bear against a real cost that was previously only visible in spreadsheets. We can expect this kind of AR technology to eventually lead to improved factory design tools.

INTELLISENSE.IO

IntelliSense.io is a market leader in the Industrial Internet of Things (IIoT), machine learning and AI sector. It provides a range of applications and services through an innovative platform to help eliminate inefficiencies and improve productivity yields in plants, processes and people.

Its platform uses technologies like machine learning and physical models that analyse real-time and historical data to predict and simulate future performance. It also uses virtual sensors based on its customers' data and sensor networks to plug data gaps as well as advanced analytics and automation outputs from statistical, physical and machine learning models. These allow businesses to identify areas for improvement. They can, for example, monitor the quality and safety status of materials during transportation, track the supply chain from end to end, and identify and respond to any bottlenecks more quickly. Reduced performance variability, less unplanned downtime, and the optimised use of resources lead to lower energy consumption and associated costs.

IntelliSense.io delivers optimisation as a service (OaaS) through a combination of software and networks, wherein the IoT platform and Big Data technologies are integrated in ready-to-use software applications.

The company's client base is primarily in capital and asset-intensive industries and it has built substantive partnerships in the natural resources and mining industry. Its customers include one of the largest copper and gold mines in Latin America, which has seen a 55 percent reduction in its variability, and a uranium mining site in Kazakhstan which has seen a 15 percent increase in system efficiency and energy savings and a 7.5 percent increase in yield.

The success of IntelliSense.io is founded on the power of new technology. Older technologies could not continuously manage changing operating environments and did not have the ability to predict the mineral composition of feed. The company's leading technologies, in contrast, significantly benefit its mining customers, where

input materials vary on an hour-by-hour basis and connectivity has been difficult in the industry's often harsh and extreme environments.

Benefits to IntelliSense.io:

- Being a market leader allows it to gain a competitive first-mover advantage and develop more global customers. As the costs of the IoT, data analytics, and AI technology decrease, its profits will further increase.

Benefits to its customers:

- Optimisation is delivered as a service with no CAPEX investment required.
- Deployment is realised with minimal disruption to existing operations.
- Improved business efficiency from the optimisation of production processes reduces energy consumption, water requirements, unplanned downtime, and results in higher yields.
- Lower costs/higher revenue from reduced unit costs can be reinvested or passed onto consumers in the form of lower output prices.
- Enhanced natural resource use.
- Extended equipment lifetime further reduces production costs and waste.
- More stable and secure operations.

Wider benefits to the UK economy:

- IntelliSense.io helps the UK lead in emerging sectors and markets, improving national competitiveness.
- Builds on critical UK industry strengths in the wider IoT market.
- Building international business relationships helps improve trade prospects and exports.
- Contributes towards entrepreneurship, innovation and job creation.

Potential future value:

- The Department of Energy and Climate Change estimates that £293 million of energy savings could be realised among SMEs by making use of Big Data analytics in logistics and transportation alone.[59]
- The latest PwC Global Data and Analytics Survey found that 49 percent of manufacturers expect advanced analytics to utilise assets efficiently.[60]

A RESILIENT NATION

The government report 'The Future of Manufacturing' predicted that the UK would see increasingly frequent and large disruptions – from material availability due to geopolitics, floods, droughts and energy disruptions. IDTs have the potential to mitigate these kinds of disruptions because they enable manufacturers to drive resource productivity and reduce the resources required for each unit of value-add they produce.

Smart energy systems are a clear example of IDT's potential, and the current UK market for such systems is already worth approximately £160 million per year. Open Energi (see case study on the following page) is a growing IDT company using sensors to identify short-term strains on the National Grid and adjust the amount of electricity being consumed by industrial equipment (such as refrigerators or heating systems) for short bursts. These adjustments have

---

[59] https://www.gov.uk/government/publications/smart-technologies-in-smes

[60] https://www.pwc.com/us/en/advisory-services/data-possibilities/big-decision-survey.html#ToolSpeed