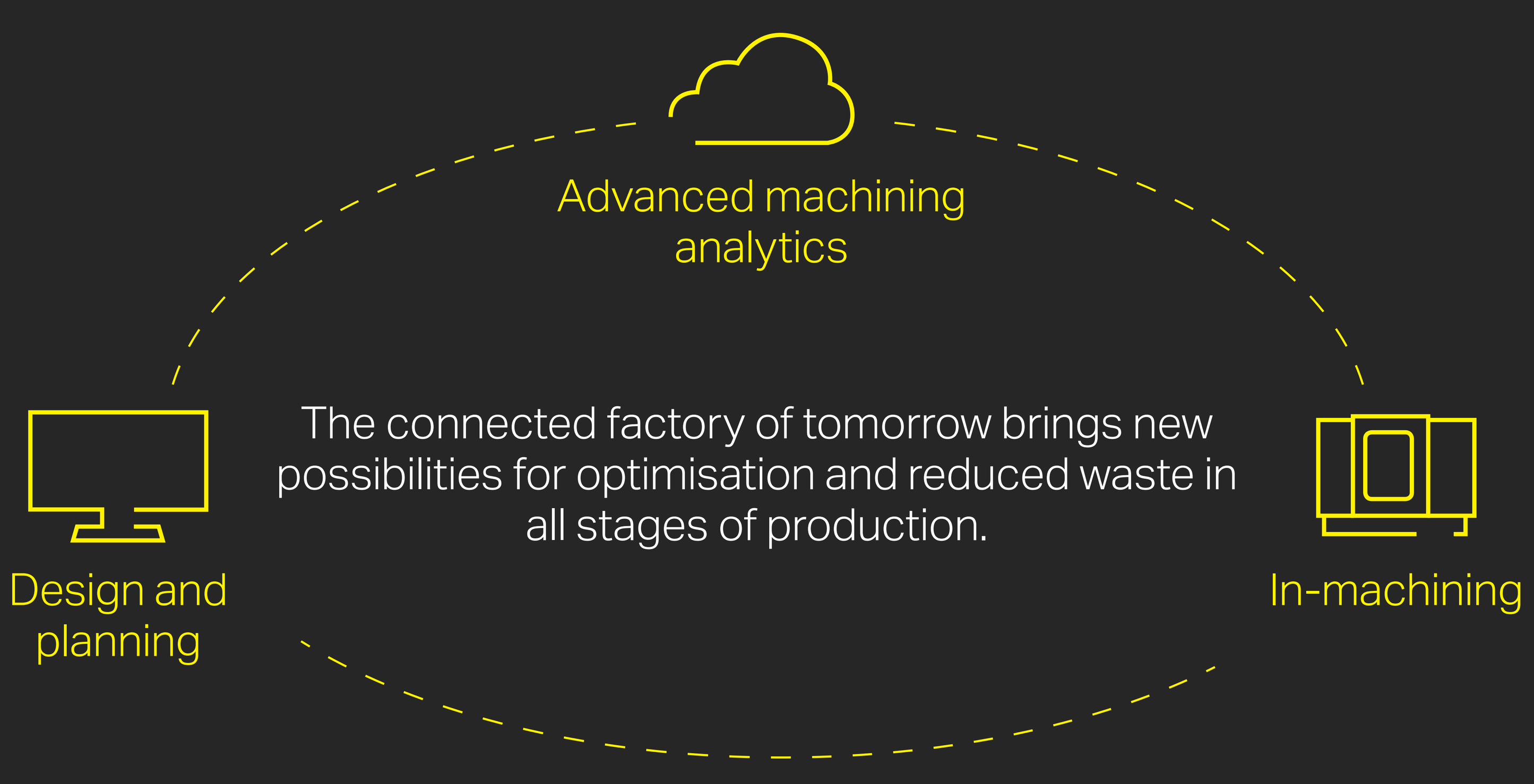
Industry 4.0 from a machining perspective



The connected factory of tomorrow brings new possibilities for optimisation and reduced waste in all stages of production.

Conventional manufacturing	Industry 4.0

Design and planning

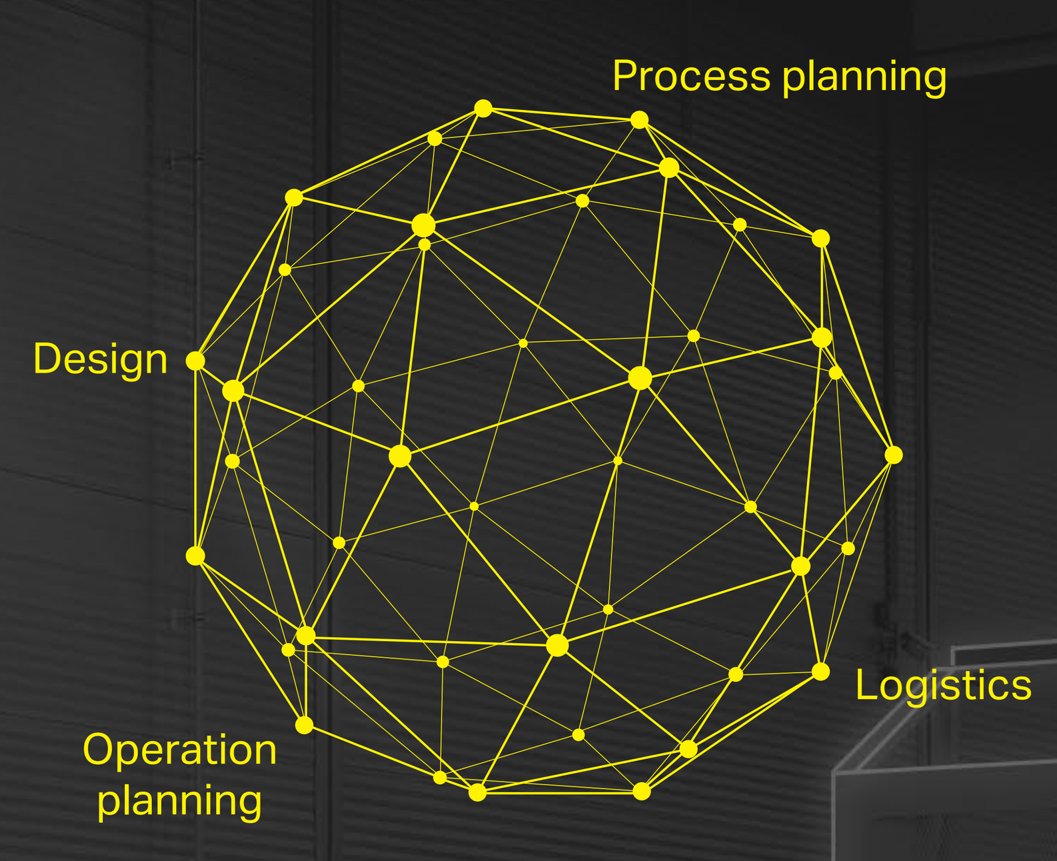
Conventional manufacturing

- Design
- Process planning
- Operation planning
- Logistics

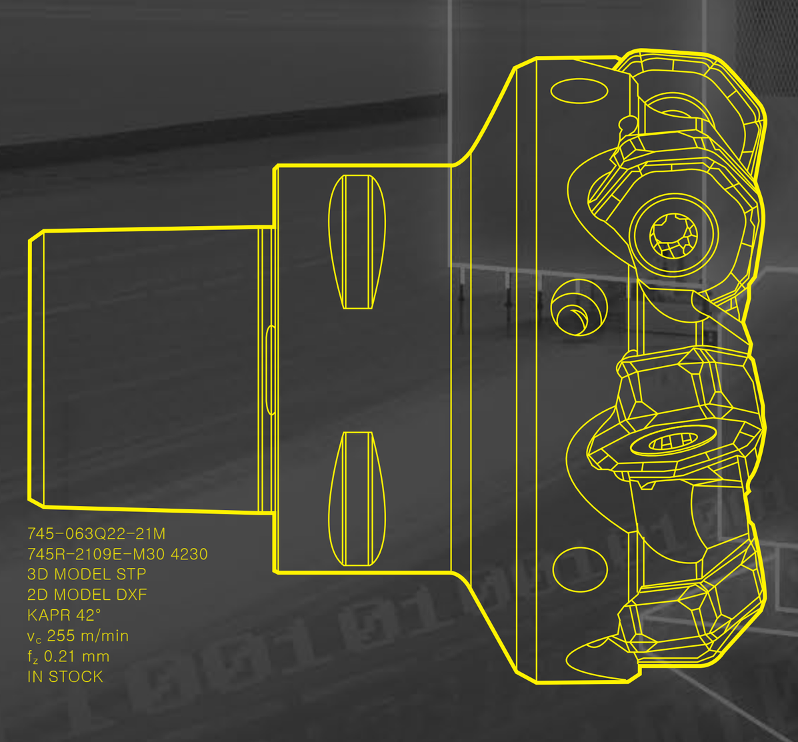
Manufacturing consists of several subsequent processes that do not interact with each other. In computer aided manufacturing (CAM), manual work is needed to obtain tool and cutting data. The work involved is time consuming and the data is often of poor quality.

Creating a model of a tool for CAM simulation often means that a simple design of the tool must be created. Tool data is gathered from web pages, catalogues and so on, with risk of errors being made.

Industry 4.0



In manufacturing under Industry 4.0, all stages of the value chain are connected and communicate with each other. The component to be produced is designed for manufacturing using advanced analytics based on data and experience collected from a range of sources.



A virtual model of the tool, together with all data required for machining, is easily accessible at all stages of the process, making it possible to create a perfect digital twin of reality – as a result, simulation and preparation are faster and more accurate.

In-machining*

Machine utilisation and process stability

Conventional manufacturing	Industry 4.0
50%	85%
Low machine uptime due to unplanned stops and inefficient use of tools.	Predictive maintenance, optimised machining process, no unplanned stops – meaning high machine utilisation made possible by advanced analytics of data from connected machines.

Metal removal efficiency

Conventional manufacturing	Industry 4.0
80%	95%
Tool choice and application based on experience and skills.	Optimised tool choices, tool paths and cutting data adapted to the actual machining conditions.

Traceability and process improvements

Conventional manufacturing	Industry 4.0
10%	85%
Only a fraction of all data is recorded and is seldom used for process improvements.	A huge amount of data from the machining process can be recorded and analysed in real-time or stored for process improvements.

Capital efficiency

Conventional manufacturing	Industry 4.0
80%	95%
Capital is wasted on having an excessive number of tools and on storage of goods.	Streamlined logistic solutions with optimised inventory levels maximise capital efficiency.

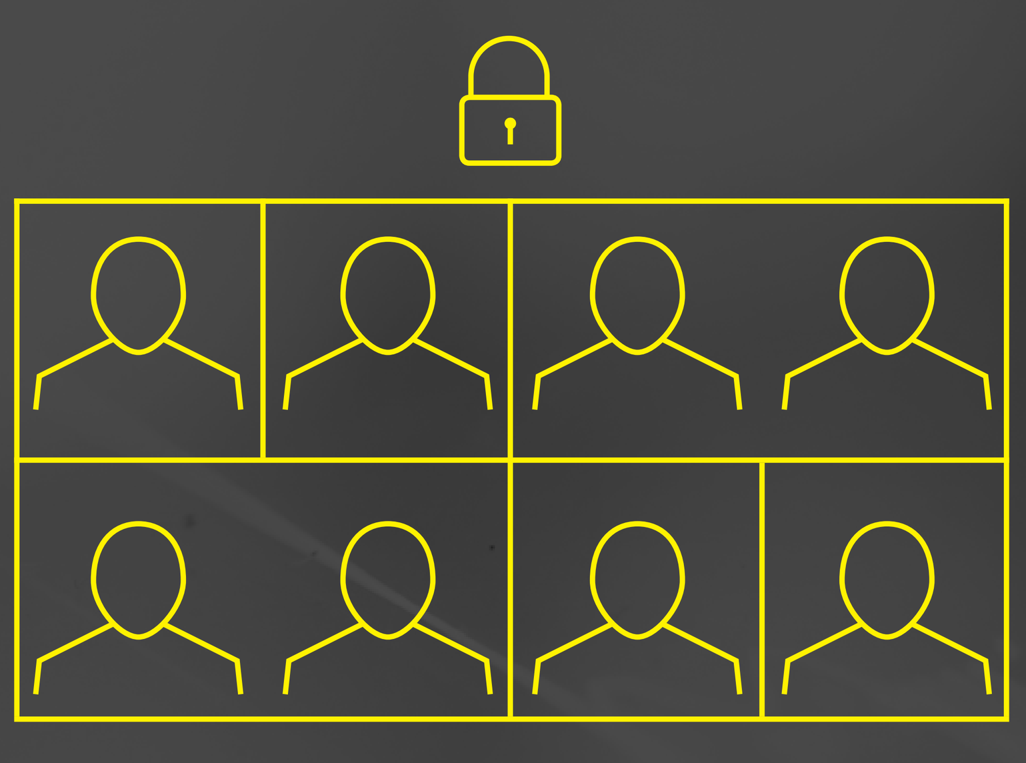
Sustainable machining

Conventional manufacturing	Industry 4.0
30%	60%
Only 1/3 of the total energy consumption is used for machining of the components.	Process optimisation will lead to less energy consumption and most of this energy is used for machining.

With sensor-based tooling solutions, data can be collected from the machining processes and used to optimise operations. This will improve overall efficiency and lead to higher metal removal efficiency, increased machine utilisation, better component quality and a more sustainable production process.

* Figures are estimations based on results from ongoing R&D projects.

Advanced machining analytics



Isolated knowledge

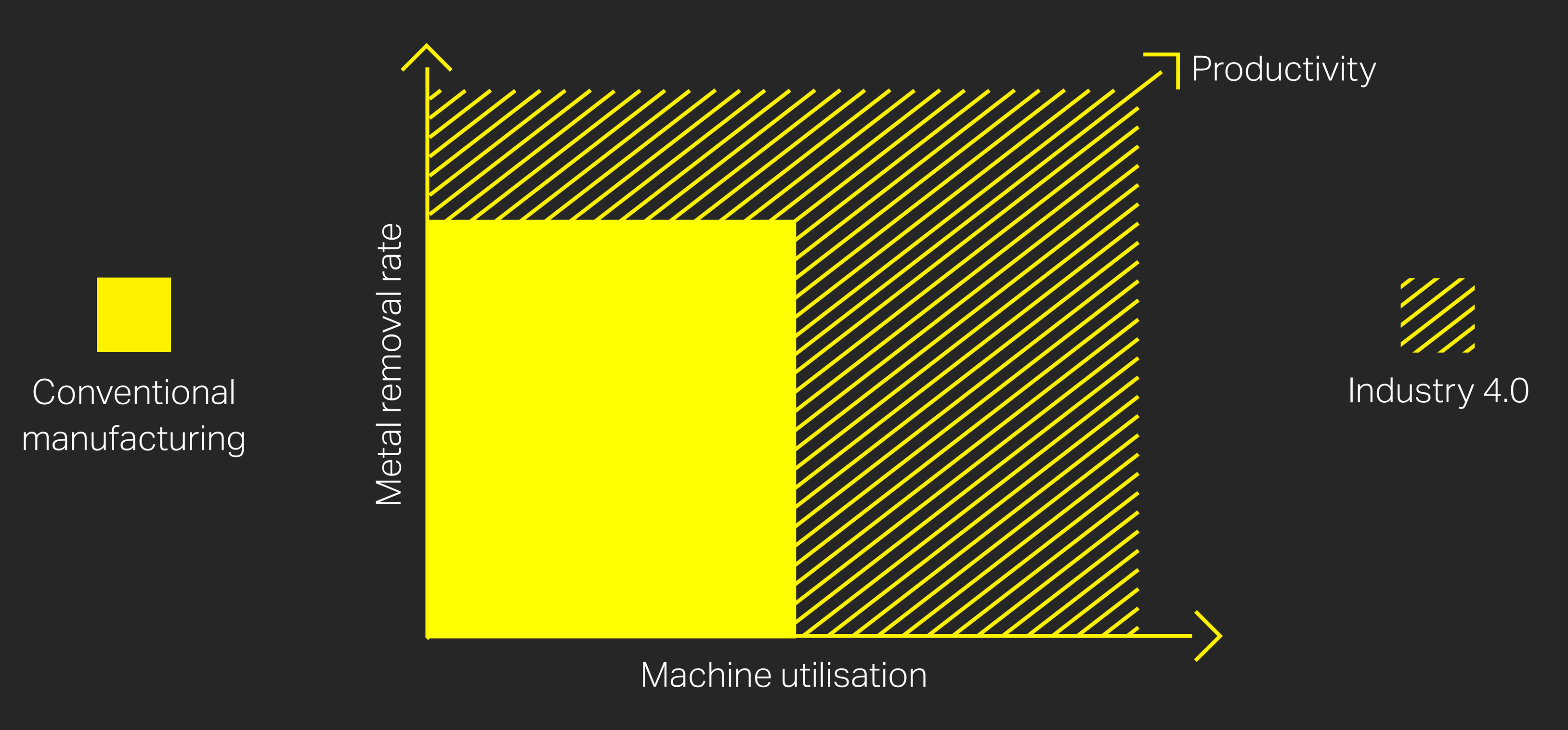
Some data can be retrieved from machining in a conventional workshop, often through the experience of a single person. However, while skilled individuals are essential to the success of any company, having this vital information isolated makes a company vulnerable to competence loss. Having this data hard to access also makes it difficult to share important information between different people and functions within the organisation.

Shared knowledge

With cloud-based solutions it is possible to collect and process data from machines, factories and even individual tools within the company. The data can be analysed by using advanced algorithms in order to gain learnings and optimise processes. With instant access to information and data, new collaboration opportunities are made possible between people in different parts of the organisation and different parts of the world.

- Inefficient use of resources
- Few optimised processes
- Time-consuming manual work

- Efficient use of resources
- Optimised processes
- High degree of automation



Digital machining is set to transform the future of manufacturing, the biggest benefits being a significant increase in optimisation of processes and better, more fact-based decision making.