THE DEVELOPMENT OF A DIGITAL COUNTERPART TO AID DECISION SUPPORT ON ENERGY CONSUMPTION OF AN ACTIVE MANUFACTURING PROCESS

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Agenda

- Area of research
- Manufacturing process
- Digitalisation method
- Conclusion
- Future work

Area of research

Paper Title:

The development of a digital counterpart to aid decision support on energy consumption of an active manufacturing process

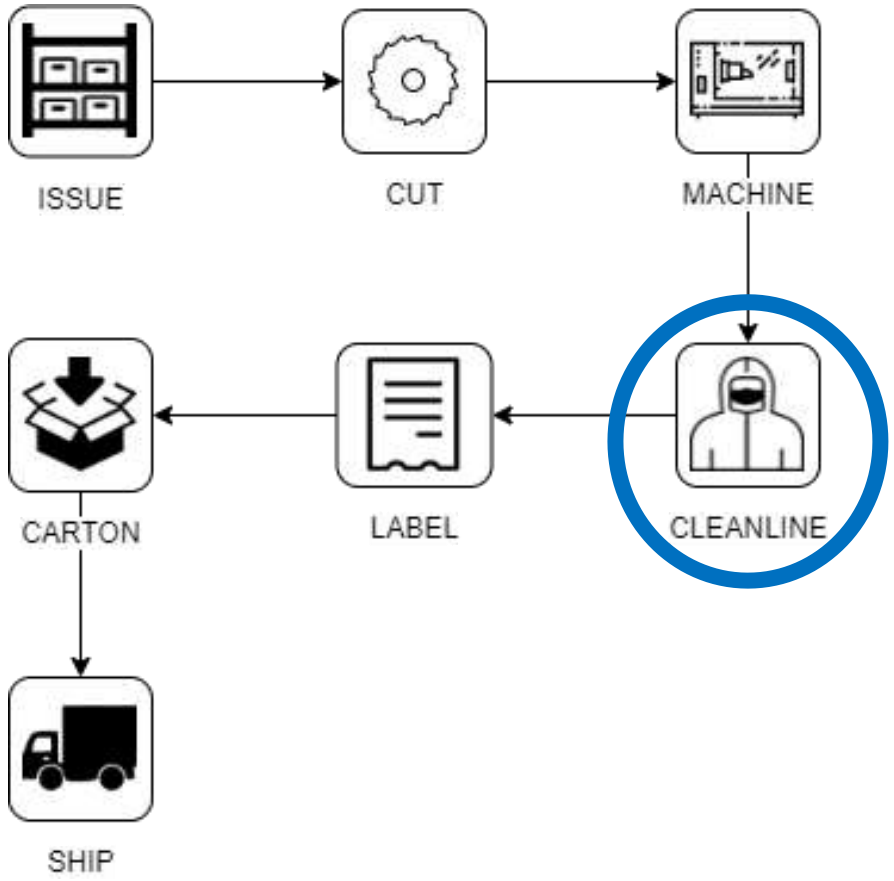
Purpose of Study:

The development a digital model of a manufacturing process with the purpose of providing decision support for operators in relation to energy consumption.

Objectives:

Initial development of a digital model to determine the most efficient means to reduce consumption, by identifying and collecting energy data from a biomedical process to develop an understanding on how energy is consumed.

Manufacturing process

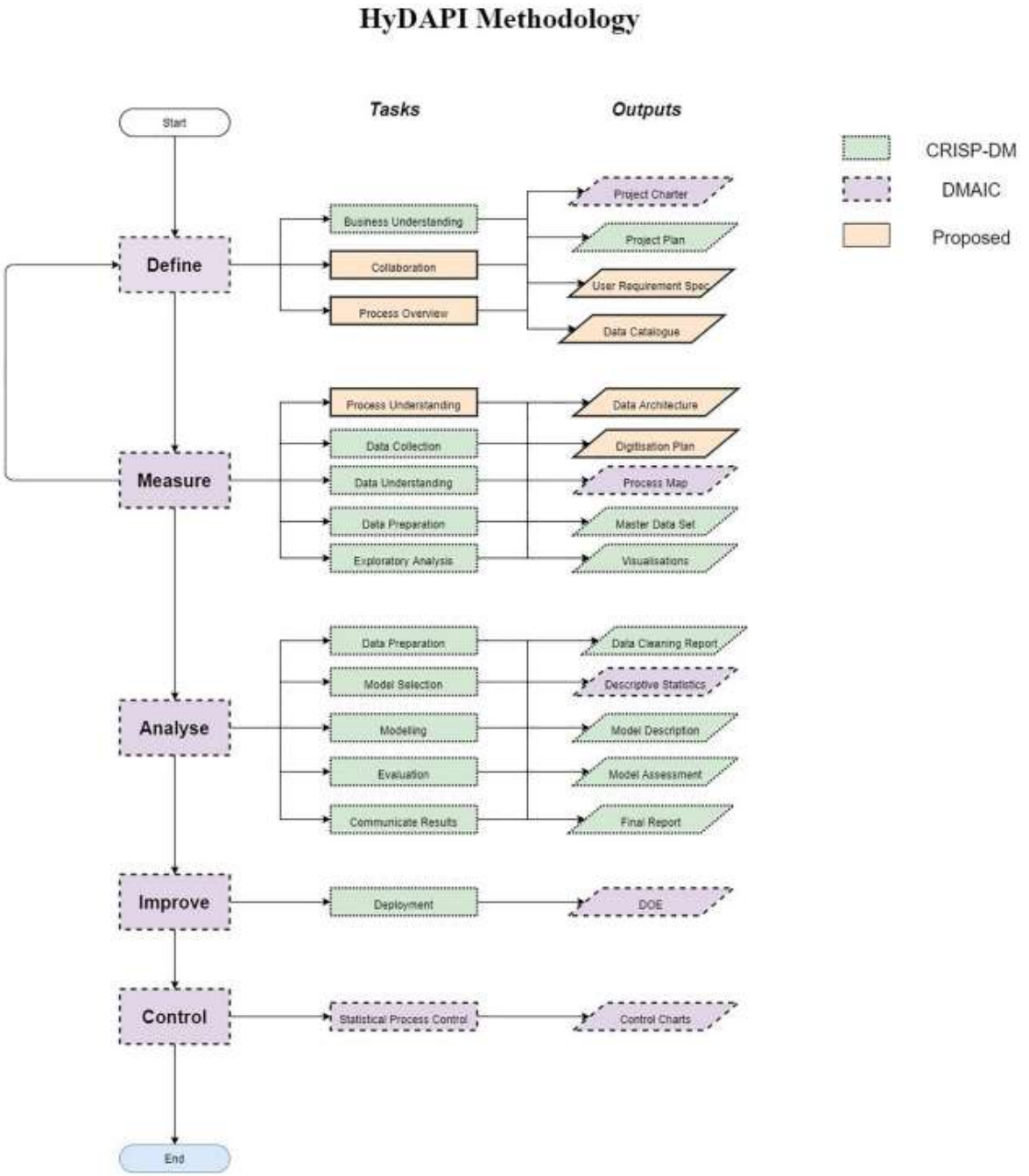


Method applied

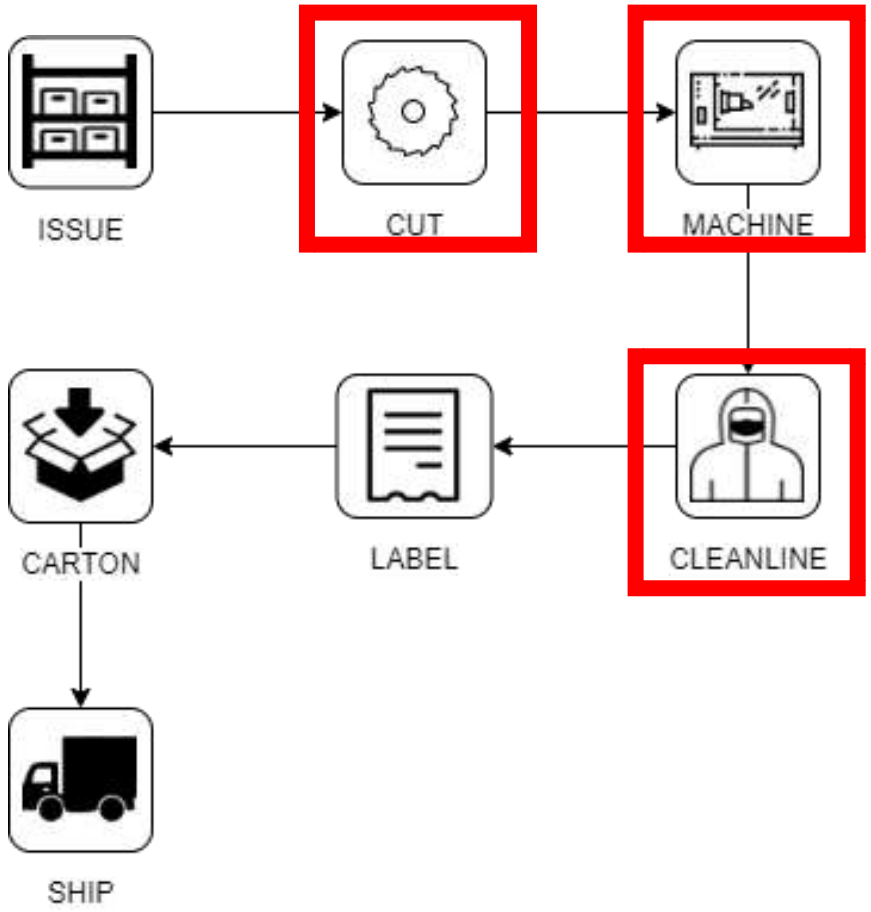
Application of HyDAPI method for digitalisation manufacturing processes (Clancy, O'Sullivan and Bruton, 2021).

DEFINE:

- Project Charter
- User Requirement Specification
- Data Catalogue

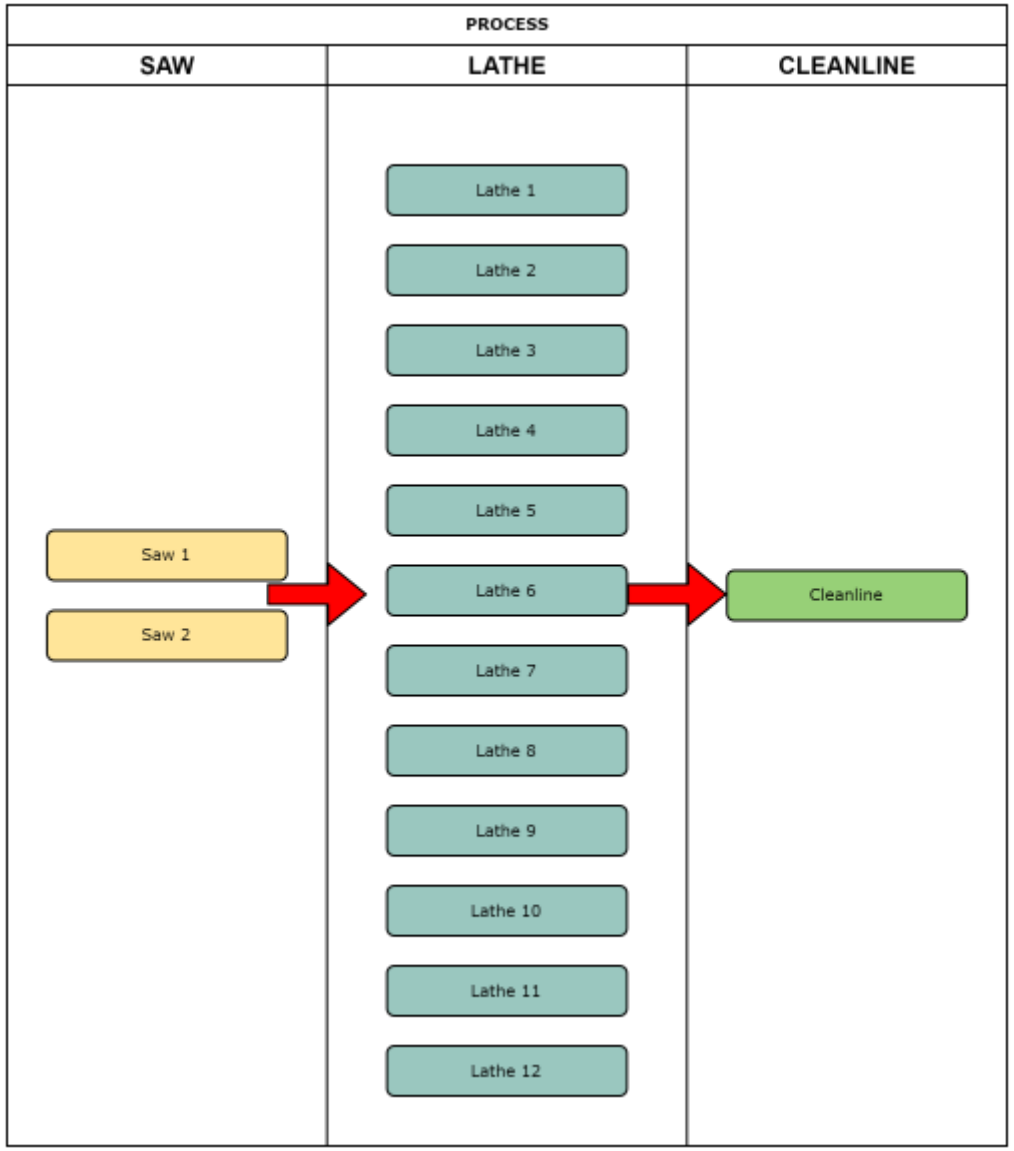


Manufacturing process



Project Charter

User Requirement Specification



Operational Maintenance Energy

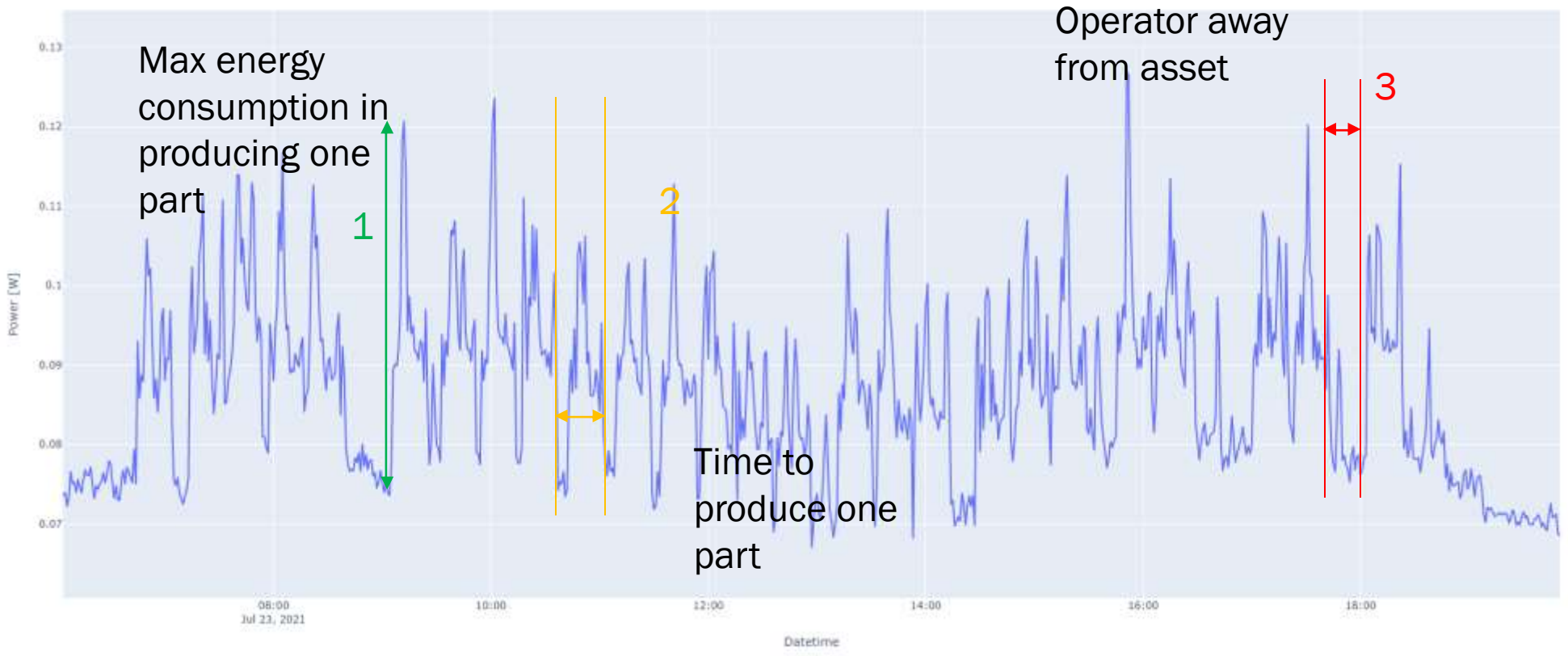
Data Catalogue

Available Data

Data Type	Name	Unit	Granularity
Operational	Time (Date Shift)	Date	12h (Shift)
Operational	Units Produced	Units	12h (Shift)
Operational	Units Scrapped	Units	12h (Shift)
Operational	Target Unit Production	Units	12h (Shift)
Operational	Batch ID	Unique ID	Per batch
Operational	Parts lost	Units	12h (Shift)
Maintenance	Downtime	Time	1h
Maintenance	Status	Status code	Per change
Maintenance	OEE (Overall Equipment Effectiveness)	%	1d
Energy			

Data Analysis

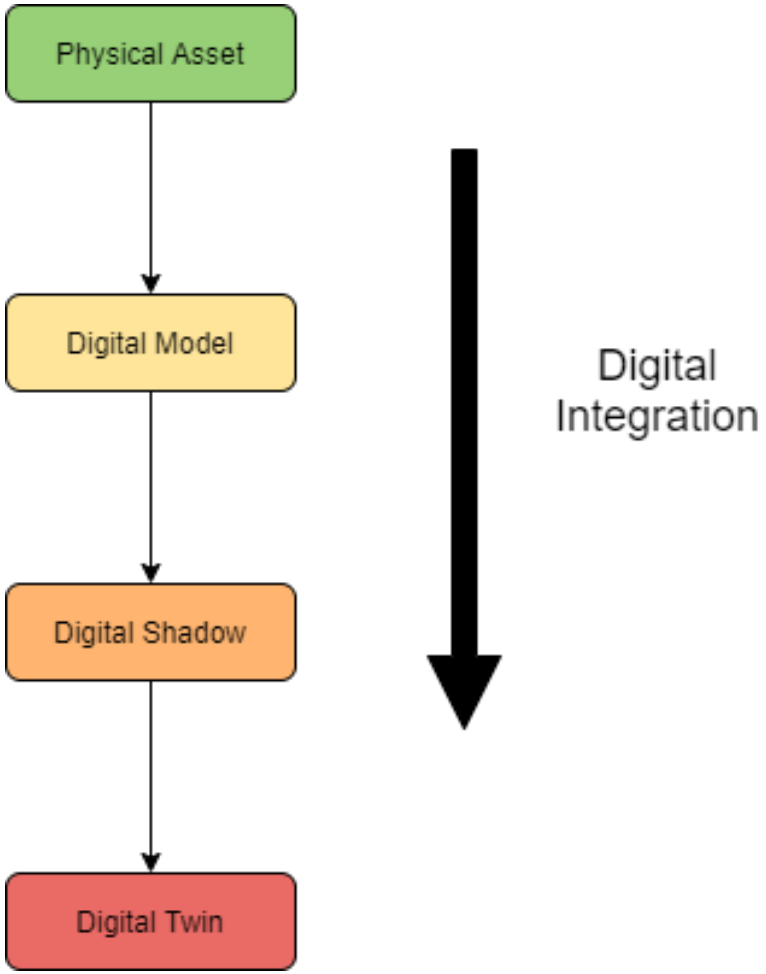
Analysis of energy consumption over one shift period



Results

Operational	Maintenance	Energy
Sufficient	Requires further development	• Energy sensor network • Energy profile scenarios

Future work



- Development of a knowledge based Digital Model (DM) based using energy sensor network data with operational information currently available.
- Digital integration of DM to create synchronous Digital Twin (DT) of process, providing real-time energy consumption decision support to users.

References

- Clancy, R., O'Sullivan, D. and Bruton, K., 2021. Data-driven quality improvement approach to reducing waste in manufacturing. *The TQM Journal*, [online] ahead-of-print(ahead-of-print). Available at: <https://doi.org/10.1108/TQM-02-2021-0061>.
- Kritzinger, W., Karner, M., Traar, G., Henjes, J. and Sihn, W., 2018. Digital Twin in manufacturing: A categorical literature review and classification. *IFAC-PapersOnLine*, 51(11), pp.1016–1022.
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THANK YOU

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