

Turning Data into Action: The Importance of Explainable Analytics in Wind Farm Performance Improvement

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Asbjørn Klomp

Operating large portfolios of wind assets is a competitive business where details matter



You are tasked with squeezing every last drop of value



Standard response is to prescribe black-box analytics



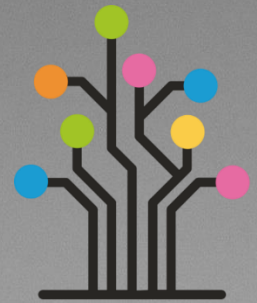
We believe in an open approach, leveraging our joint in-house expertise



So you can explore and easily deploy new analytics processes, maximise value of your data, share results and encourage action



We offer cost-effective solutions so domain experts ask better questions, derive greater insight and optimise asset performance.



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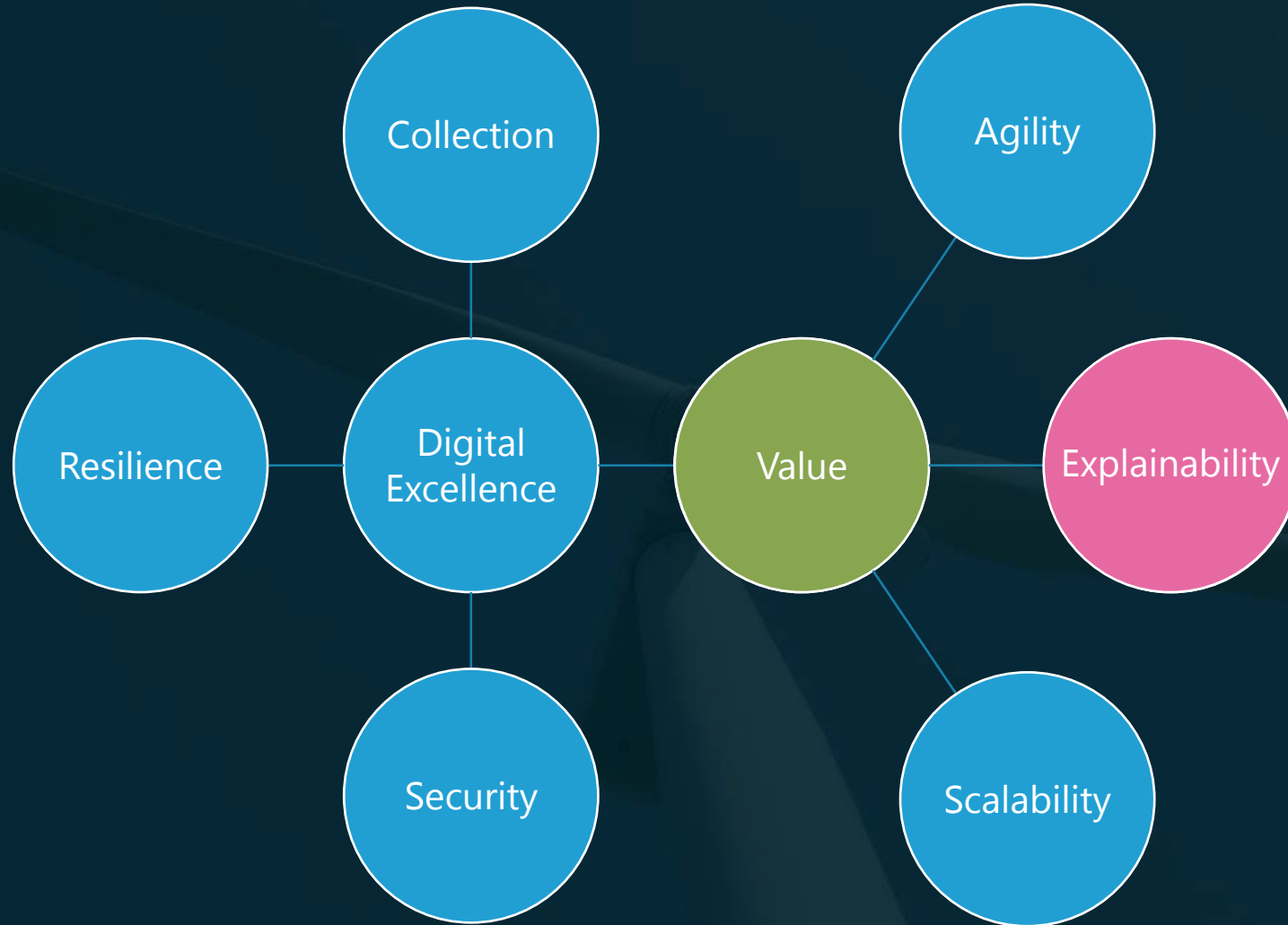
Cubico
SUSTAINABLE INVESTMENTS



Orsted

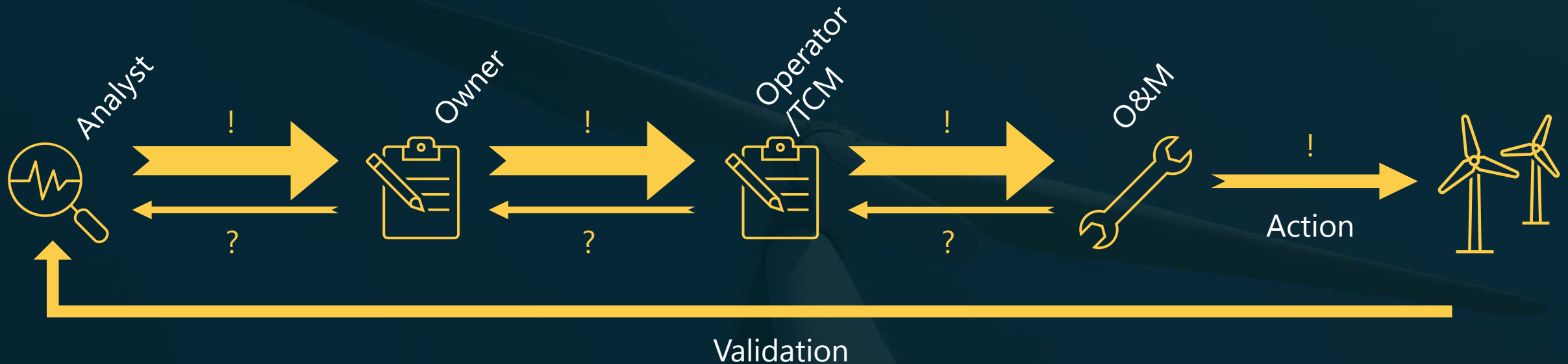


Digital excellence



From observation to action

The performance observation has to be communicated to many stakeholders with different objectives



Strengthening messaging:
Explainable analytics

Keep communication
lines as short as possible



Analytics requirements

O&M Requirements:

- Ability to reproduce results
 - No black box
 - Clear traceable processes
 - Communicated assumptions
- Narrowed down to actionable insights
 - Not too broad statements that require significant further investigation

Operator/TCM Requirements:

- Understanding of cost/value of the issue
 - Clear processes on how that is calculated
 - Priority level
- Task management
- Agility
 - Adjusting analysis to suit the issue & customer needs



A more structured message

A black-box approach

- Turbine A is underperforming based on our model

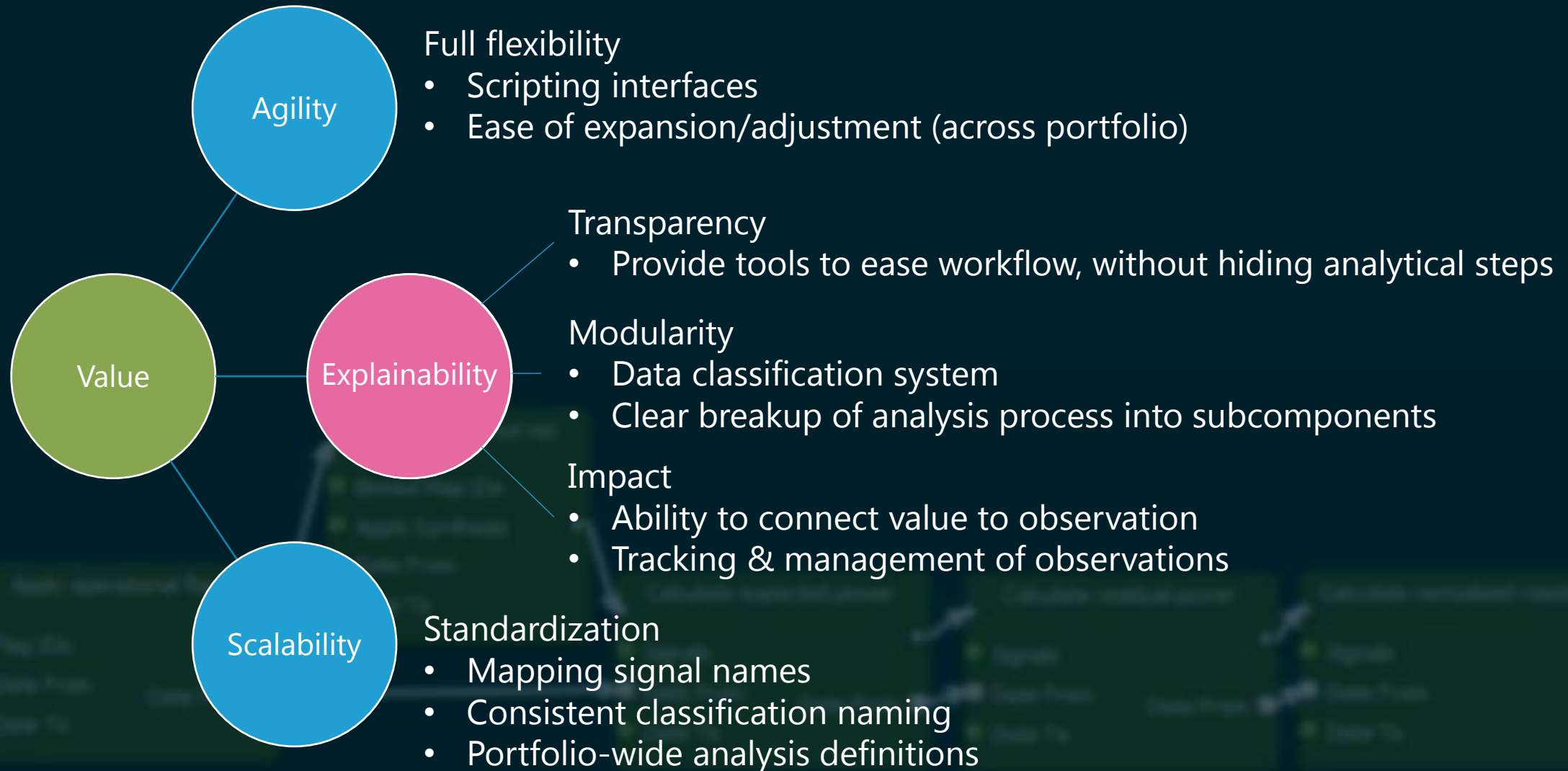
A modular approach

- No issue observed with **data quality**.
- **Turbine control** is in line with other turbines and/or past behaviour.
- **Observation**: Apparent power curve efficiency drop in partial load observed from date.
- **Further supported** by comparison of power and wind speed vs neighbour before and after the change, in wake free sector.

- **Impact on AEP** approx. 0.2%, resulting in an estimated loss of £3.5k/annum
- **Potential causes**: aerodynamic efficiency, loss of blade furniture, yaw analysis inconclusive.
- **Suggested action**: investigate on site at next suitable opportunity

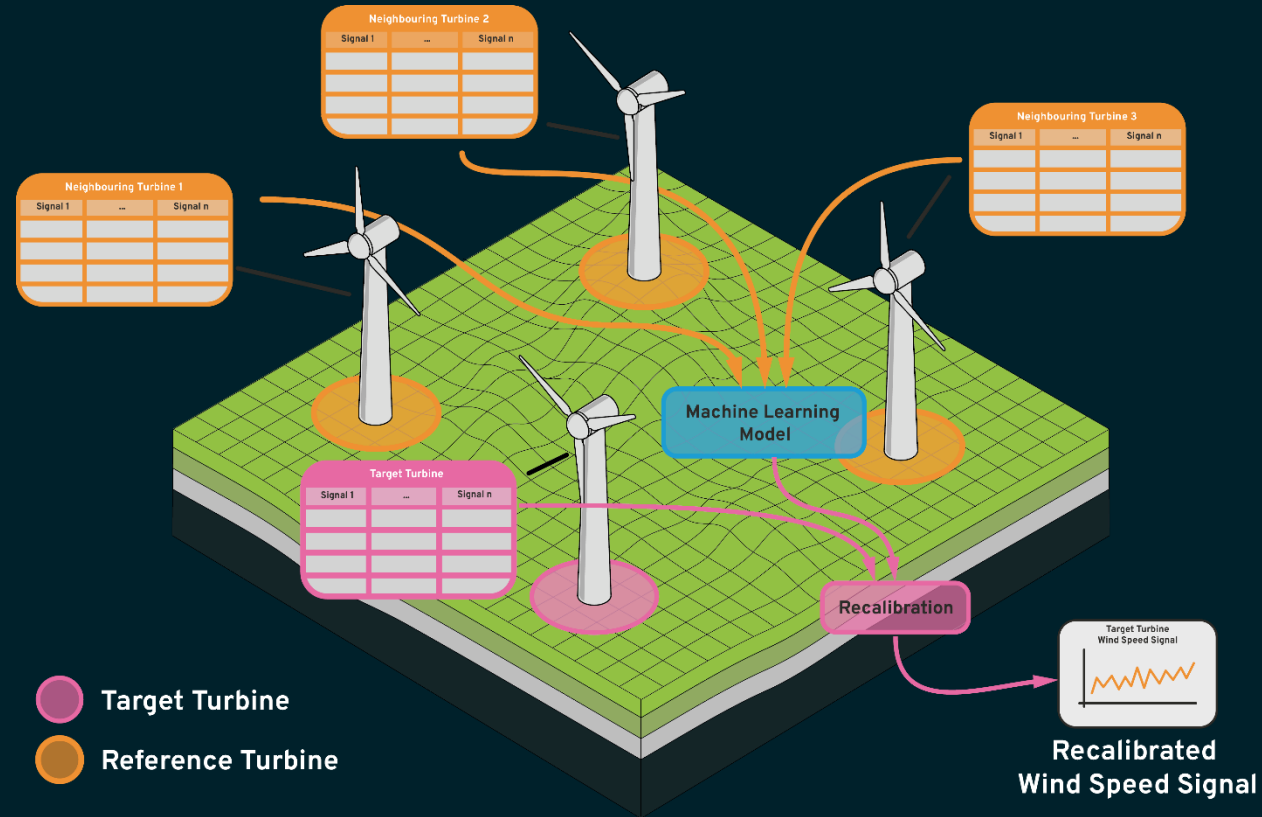


Software requirements



Advanced analytics examples

- **Modelling of more complex relationships**, e.g., wind speed recalibration with neighbouring turbines*
 - Features: generator speed, torque/power & pitch neighbouring turbines
 - Output: "Calibrated" wind speed target turbine
- **Increased analysis sensitivity** for early alerting
- **More accurate** loss estimations



*As presented at WESC 2023, more information available!



Using advanced analytics

A modular approach

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- **Further supported** by using calibrated wind speed, showing there was no clear change in correlation of wind speed measurement with neighbouring turbines' operational signals, when the change in power curve efficiency was observed.



- Open approach delivers trust in analytics
- Modularity brings a more comprehensive overview, and targeted action, and ability to ask precise questions of advanced analytics
- Value observations are required to support prioritization

Asbjørn Klomp

asbjorn@bitbloom.tech

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