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BALANCE & TRADE-OFF CAPEX-OPEX-CARBON

APPLIED DATA SCIENCE PERSPECTIVE
DISCUSSION PAPER

SUMMARY

Today, among a businesses' most significant assets, are the data that it possesses. DTA discusses its advanced data science tactics and practices to deliver:

1. Increased productivity via:
 - Enhanced asset performance and optimisation.
 - Reduced down-times.
2. Decarbonisation targets faster with transparent and traceable reporting.

PROBLEMS

A new challenge is emerging for asset-intensive businesses in the form of increasing demand for embedded, mature carbon emission reporting. Monitoring complex processes related to assets can make the task of collating, synthesising, and reporting on asset performance daunting. Emissions reporting adds to this challenge. Yet effective, real-time reporting is within reach for most organisations via solutions like Digital Twinning Australia's (DTA's) digital twins and other data modelling solutions.

Effective reporting on asset performance, particularly emissions reporting, requires organisations to break down data silos, to optimise the handling and analysis of data, and to ensure that the systems organisations use are able to communicate with one another. For a range of reasons, this seemingly simple task can appear daunting.

The failure to address any one of these issues can significantly hinder decision-making by keeping actionable data and intelligence out of reach and leave organisations blind to the actual performance of their assets. Often, all that organisations need is a tool set to collate and synthesise the vast amount of data these businesses have accumulated over the years. Properly demystified, collated and interpreted, this data can offer most solutions to current inefficiencies.

The coupling of modern middleware with advanced data science to create DTAI-ML™ is delivering asset-intensive businesses with the capability to seamlessly stream economic and decarbonisation data for calculated decision-making. DTA's technology offers crucial balancing and trade-offs between capex, opex and carbon emissions impact. This leads to smarter, cost-effective decisions that align with both profitability and sustainability goals.

In an environment of heightened reporting requirements for emissions, the primary challenges include:

1 DATA SILOS

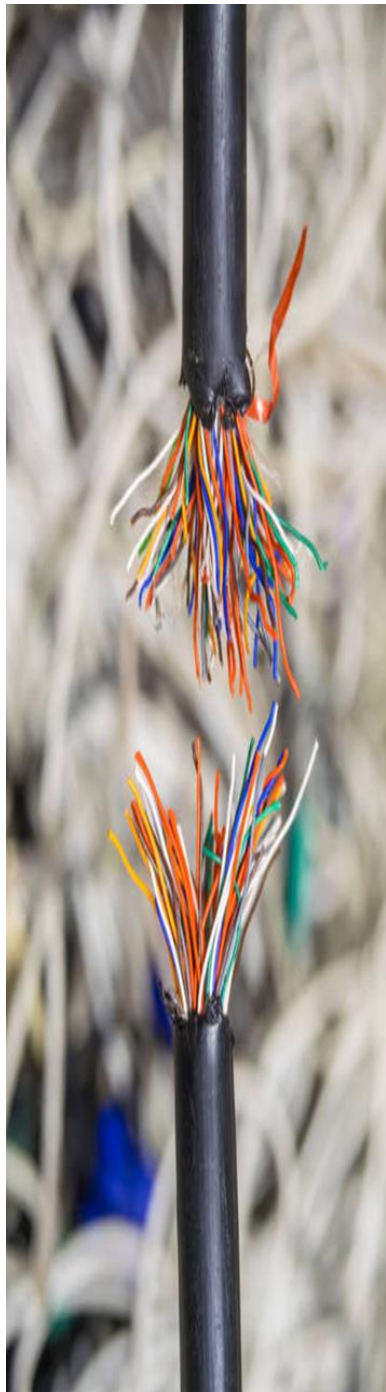
Data stored in isolated segments within the organisation leads to a lack of integration and accessibility, hindering effective decision-making.

2 UNOPTIMISED DATA FLOW

Existing data flows underpinning business processes may not be streamlined or automated, leading to inefficiencies in handling and analysing data.

3 DISPARATE DATA SYSTEMS

The use of various systems that do not communicate with each other exacerbates data fragmentation and complicates the retrieval and analysis process.



SOLUTIONS

DATA SILOS

Current state: For industrial plants and facilities that rely heavily on physical assets, the manner in which information is stored can create significant challenges. Typically, sections within a facility operate as isolated islands of knowledge. This situation is commonly referred to as data silos, critical information becomes segregated, making it difficult for seamless collaboration. This is akin to having puzzle pieces scattered across different rooms, hindering the ability to grasp the overall picture. Such a scenario not only complicates the facilities ability to make prompt, well-informed decisions but also misses opportunities to enhance strategy & operations or for cost reductions. Data silos hinder any ability to compare, contrast or validate facility data, data fundamental to balance and trade off capex, opex and carbon parameters.

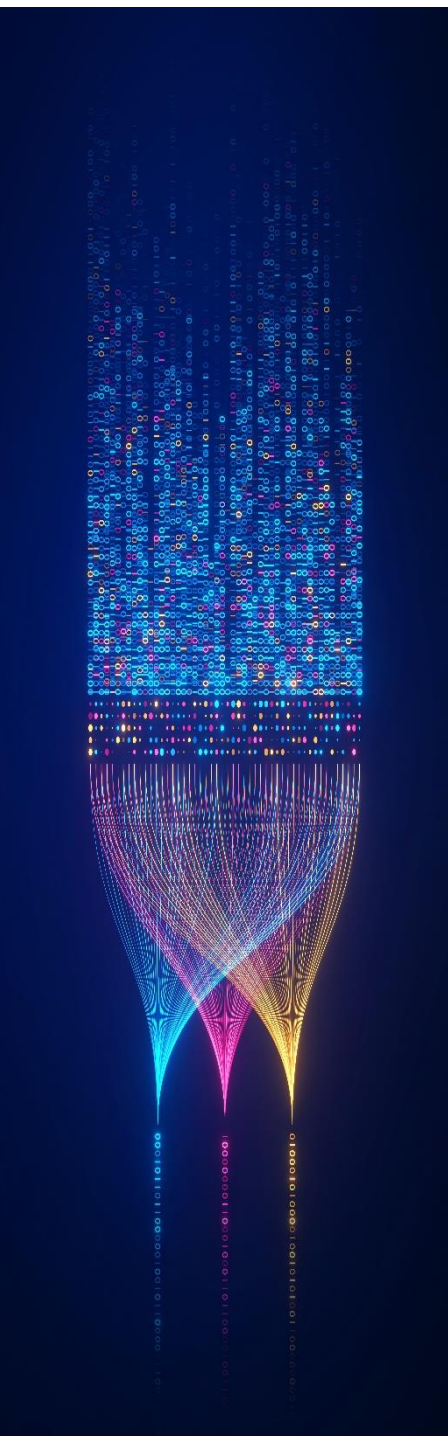
Common practices: A common practice implemented by businesses involves data integration and cloud infrastructure. These approaches focus on standardising and consolidating data from diverse sources. However, it encounters notable drawbacks, particularly:

1. **Linear and centralised systems:** The linear nature of centralised data management leads to inefficiencies and bottlenecks, especially as data volume and complexity grow. This centralised practice struggles with flexibility and seems slower to adapt to rapidly changing data demands.
2. **Complexity and cost:** Centralised data integration and cloud infrastructure is both complex and costly. Managing complex processes to integrate diverse data sources, e.g., interoperability of enterprise applications and then with operating technologies, requires ever increasing governance, development and data maintenance expenses.

DTA's solution: To drive speed to market, protection of critical data and reduce data silo barriers in industrial environments DTA's approach is applied alongside common practice. By deploying an asset-data-gateway (modern middleware), simultaneous data retrieval across various silos, e.g., production, maintenance, asset management, accounting and environmental. In short, the gateway platform associates' data, enabling efficient governance, access and data management for advanced analytics.

Benefits: By inserting DTA's centralising asset-data-gateway [DTAi-ML™], industrial facilities significantly enhance data governance across silos, leading to marked improvements in productivity and decarbonisation targets. This gateway allows the capex, opex and emissions data to be coupled. The benefits of adopting this system include:

- **Insight** - Energy optimisation: The asset-data-gateway aggregates energy consumption data from multiple sources, enabling detailed analysis of energy use patterns from horizontal and vertical systems. This insight drives targeted strategies to address inefficiencies, resulting in notable cost reductions and furthering the facility's' commitment to sustainability.
- **Foresight** - Enhanced emissions monitoring: The facility achieves comprehensive, real-time tracking of emissions for critical assets across the value chain. This not only facilitates regulatory compliance but also unveils avenues for reducing emission impact on capital budgets and prioritization of operational maintenance expenditure.
- **Actionable insight** is then derived from machines learning and employees asking questions to arrive at answers to their problem.



UNOPTIMISED DATA FLOWS

Current state: Businesses often face the challenge of processes having grown complex and inefficient over time. To resolve this situation technology solutions have proliferated. When coupled, processes and technology has led to wasted resources, missed opportunities and an increasing volume of data; data that is mostly untapped. A common example is the continued use of manual routines despite the availability of automation technologies or a willingness to critically evaluate the underlying data flows running through processes.

Common practices: Businesses today are increasingly leveraging data-driven solutions to boost efficiency and make smarter decisions. By using advanced analytics, companies can filter through large volumes of operational, live Internet of Things (IoT), dynamic and static text data to identify inefficiencies in complex processes. However, transitioning to these innovative, data-centric, platform driven approaches present several challenges:

- **Data validation:** Data-driven strategies for operational improvements necessitates ensuring the accuracy and validity of underpinning data; the data needs to be cleansed.
- **Cultural resistance:** Moving away from traditional, manual processes to modern, data-driven methods can encounter resistance, slowing the adoption. Resistance is arguably due to perceived data distrust.

DTA's solution: DTA presents a unique solution using its proprietary technology, DTAi-ML™. DTAi-ML™ is a platform-software-as-a-service solution designed to streamline and automate data flows resulting in optimised processes. Distrust risk is mitigated via open data traceability mapping. The key differential aspects are:

- **Data validation and baseline setting:** To address the issue of data validation DTAi-ML™ applies a standard set of constraints to validate the data, ensuring its accuracy and reliability. This early effort defines a trustworthy baseline for subsequent analysis.
- **Intuitive analytics experience:** DTAi-ML™ technology blends innovative analytics with traditional dashboard visualisation and persona-based interactivity. The technology becomes a tool for safe collaboration across silos and be a default vehicle for deep learning.

Benefits: The platform and software-as-a-service combined with embedded advanced analytics plus a generative intelligence layer provides corporate, strategic, functional and operations persona with expanded capability. Capability to rapidly solve large and small problems or to quickly check the carbon emissions impact on Standards' protocols or legacy processes. The ability to optimise an organisation's value through carbon-capex-opex trade-off is also greatly enhanced as a result of streamlined data flows. Major benefits of adopting this solution include:

- **Insight - Efficiency optimisation:** The functional, operations and maintenance team can now identify not just when, but why equipment might fail, allowing for more targeted and effective shutdown or maintenance strategies.
- **Foresight – Optimal Asset Utilisation:** Capital Planning reviews and Annual budget cycles use data to explore traditional decision-making practice impact on emission reduction targets. Then balance this on-demand information with expected utilisation targets.
- **Actionable Insight - Reduced downtime:** By leveraging DTAi-ML™ technology, the facility moves from a schedule-based annual works program maintenance practice to a predictive driven practice based on historical, live and forecast data. This means that annual works programs automatically include Return on Capital Employed and decarbonisation targets when predicting what, e.g., parts will be required or when it is best value to shut down or complete maintenance.



DISPARATE DATA SYSTEMS

Current state: Businesses often struggle with managing information due to having disparate systems, systems that don't naturally integrate; they lack interoperability creating the perception that the data is too big. This disconnectedness leads to delays and errors, particularly in data flows across silos. Even when using the same technology brand [e.g., only iOS or only Android] seamless, configuration free connection of business technologies is unavailable. Without a bi-directional streaming gateway that connects systems data, data flow is obstructed, complicating tasks and financial decisions.

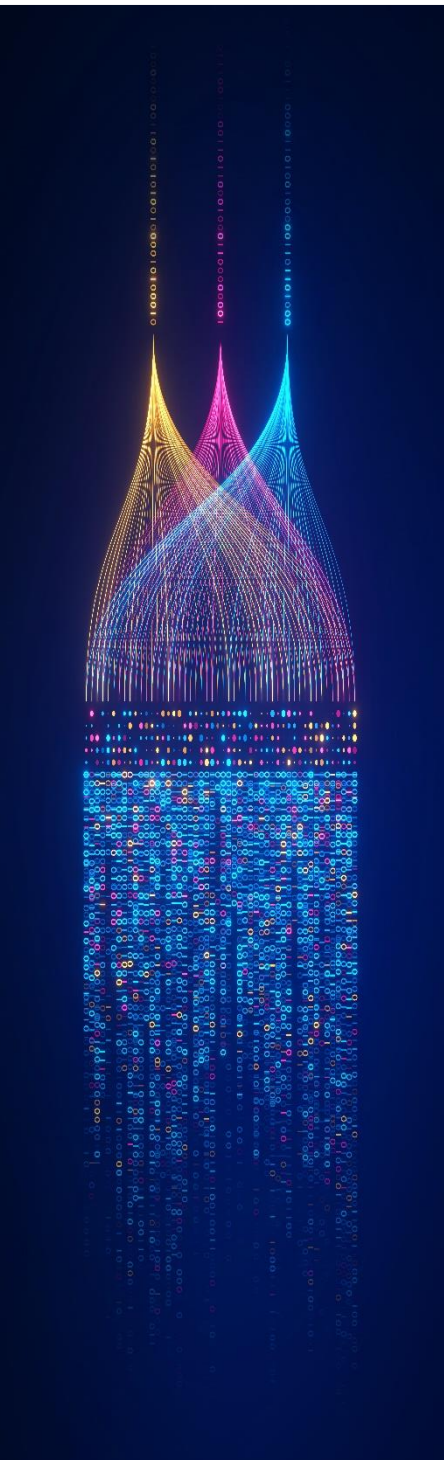
Common practices: To remedy lack of interoperability, middleware is implemented to facilitate data exchange between different systems. This involves creating APIs (Application Programming Interfaces) or employing integration platforms that act as intermediaries, allowing systems to communicate. Another frequent practice is the use of data warehousing, where data from various sources is consolidated into a central repository. However, these solutions come with significant drawbacks such as:

- **Data latency:** Data warehousing, while providing a unified data view, typically incurs delays in data availability. The process of extracting, transforming and loading data into the warehouse can impede real-time decision-making, affecting operational efficiency in environments where on-demand data access is essential.
- **Cost and complexity:** Custom integration e.g., middleware and APIs, are often expensive and complex to develop and maintain. They demand specialised skills and continuous management to ensure seamless and secure data flow.

DTA's solution: Reflective of modern middleware, combined PaaS [Platform as a Service] and SaaS [Software as a Service] technology enables flexibility, relevance and targeted scaling, accelerating deep productivity and decarbonisation capability. The core of DTAI-ML™ is a bi-directional closed loop line-of-sight from asset financing to optimal asset utilisation, for the assets' life cycle, leading to more informed insight into capex and opex balancing and trade-off.

Benefits: DTAI-ML™ has embedded advanced analytics, a unique combination of capabilities that delivers key business advantages, focused on comprehensive data driven decision support and strategic planning impact:

- **Insight** - On-demand Strategic Asset Management impact visibility: DTAI-ML™ directly connects asset and maintenance management data with financial and operating budget data, e.g., enabling fast assessments of e.g., equipment condition and health impact. This direct insight allows for faster decisions re end-of-life repairs or replacements, balancing operational needs with financial considerations.
- **Foresight** – Line-of-Sight Strategic Asset planning: DTAI-ML™ solution makes Return on Investment (ROI), Total Shareholder Return (TSR) and Return on Capital Employed (ROCE), Decarbonisation Targets data traceable and trustworthy.
- **Actionable Insight** – Balancing corporate, strategic and business planning decisions with operational reality. Closed loop line-of-sight data traceability delivers surety for actioning the why, what and when for best outcome and least adverse impact.



CONCLUSION

The coupling of modern middleware with advanced data science to create DTAi-ML™ is delivering asset-intensive businesses with the capability to seamlessly stream economic and decarbonisation data for calculated decision-making. DTA's technology offers crucial balancing and trade-offs between capex, opex and carbon emissions impact. This leads to smarter, cost-effective decisions that align with both profitability and sustainability goals.

Furthermore, DTA's expertise in automated carbon emissions reporting and alignment to regulatory compliance mitigates actual, perceived or implied green-washing allegations.

With DTA, businesses are not just making decisions; they are shaping a future where economic success and decarbonisation responsibility go hand in hand.

Actionable Insight
the ability to
ask a question
get an answer that
enables action

[...knowing that all accessible
data has been considered, &
thorough analysis undertaken.]

at speed

better than a human brain

leaving people to
do a final review,

make the decision
& take action.

aka
human centred automation



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**A DATA ASSETS
TECH COMPANY**

Our technology helps you generate continuous and measurable value from your asset data.

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