DATA SCIENCE FOR SUPPLY CHAIN

Why your Data Lab is a key ally on the road
to a truly agile and efficient Supply Chain

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INTRODUCTION

It seems obvious that Data is one of the foundations of Supply Chain Management : as the basic component of the Information flow, Data itself is a part of the very definition of Supply Chains : global networks used to deliver goods and services through engineered flows of information, physical goods and cash (source : APICS)

From Master Data driving ERP software to real-time IoT streams enabling fine grain tracking and optimization, Data is omnipresent when dealing with Supply Chain processes. However, the abundant information is not always leveraged to actually improve the overall flow. Often locked away in specialized software, siloed between departments of the same company or simply not made accessible to business practitioners, the premise of a data-driven Supply Chain falls short of expectations.

At IRIS by Argon & Co, we help our clients to build high-performing global Supply Chains by leveraging the power and benefits of Data Science techniques and tools, combined with a transformational mindset of processes and organization.

The Supply Chain IS backbone and high-value use-cases

The several global Supply Chain crises we experienced in the last few years demonstrated at least one common denominator for organizations : the growing need for Supply Chains to become reconfigurable, with the ability to adapt to changing patterns in demand as well as perturbations in resources availability.

To tackle this challenge, one approach proved to be efficient : the agile development and deployment of high-value, targeted use-cases to support Supply Chain operations. Under varying formats like dashboards, custom business planning tools, AI models, low-code apps and automated workflows, these solutions fill the functional gaps left by more wide-span software.

In this this kind of architecture, legacy software such as ERPs, APS, WMS or TMS still serve as the backbone of Supply Chain Management processes. The relevance of these software to manage both master data and transactional data under Supply Chain Management best practices is not under debate, with decades of experience baked into each solution's functionalities.

Now, to achieve the required agility over time, these monolithic solutions need to be augmented with targeted business tools. Benefits arise when such tools :

- Effectively improve the efficiency of the Supply Chain processes (example use-case: improved forecast accuracy thanks to a custom forecasting algorithm) ...

- Or provide a competitive advantage (ex. new service of vendor-managed inventory enabled by a shortage prediction at SKU level).

- Can be quickly developed and deployed (in under a few weeks or months).

- Are continuously updated to fit the latest requirements dictated by the Supply Chain reality.

Data Science use-cases for Supply Chain

If this approach can be relevant for all Operations processes (Purchasing, Finance, HR, Manufacturing...), Supply Chain functions are a particularly fertile ground to nurture high-value use cases. At IRIS by Argon & Co, we believe that Data Science techniques and tools are a key enabler of this approach. For our purposes,

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we think about Data Science as the sum of components to be combined to serve this objective : such as Data Visualization tools, Data Platforms, advanced analytics, AI / Machine Learning algorithms, etc.

In a conceptual way, data-driven solutions for Supply Chains fall under four distinct categories, in growing order of maturity (or complexity) :

Data Science for Supply Chain : 4 levels of maturity
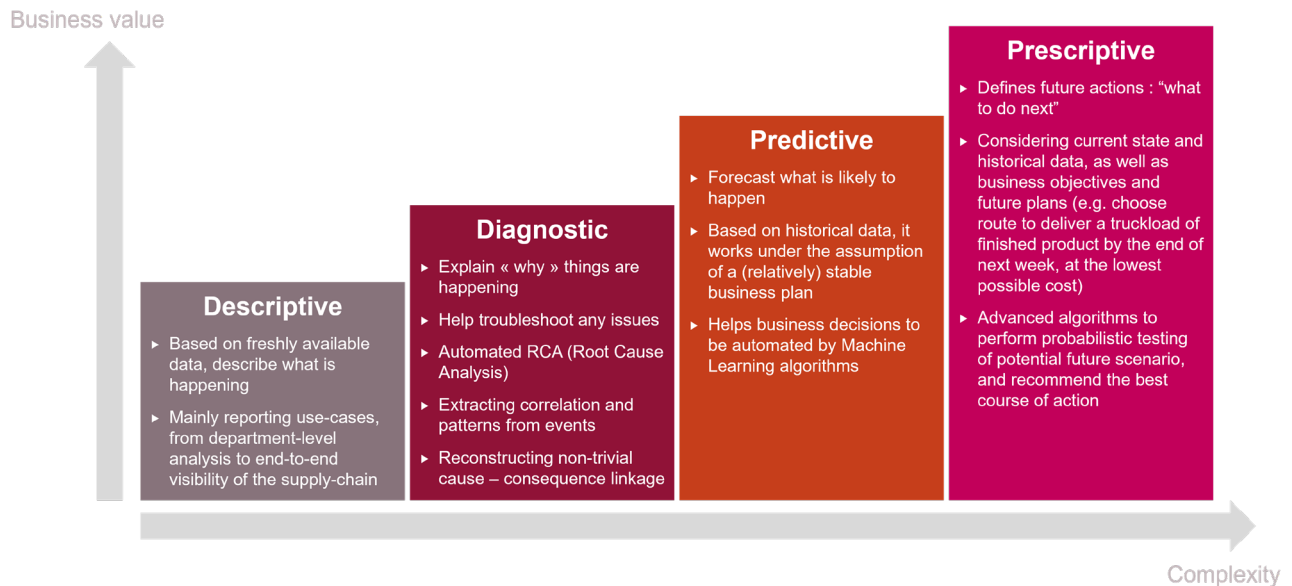
Descriptive : e.g. reporting on stock situations across all DCs and Stores, at a glance.

Diagnostic : e.g. link between a delay on a particular raw material and the customer orders that will be affected down the chain.
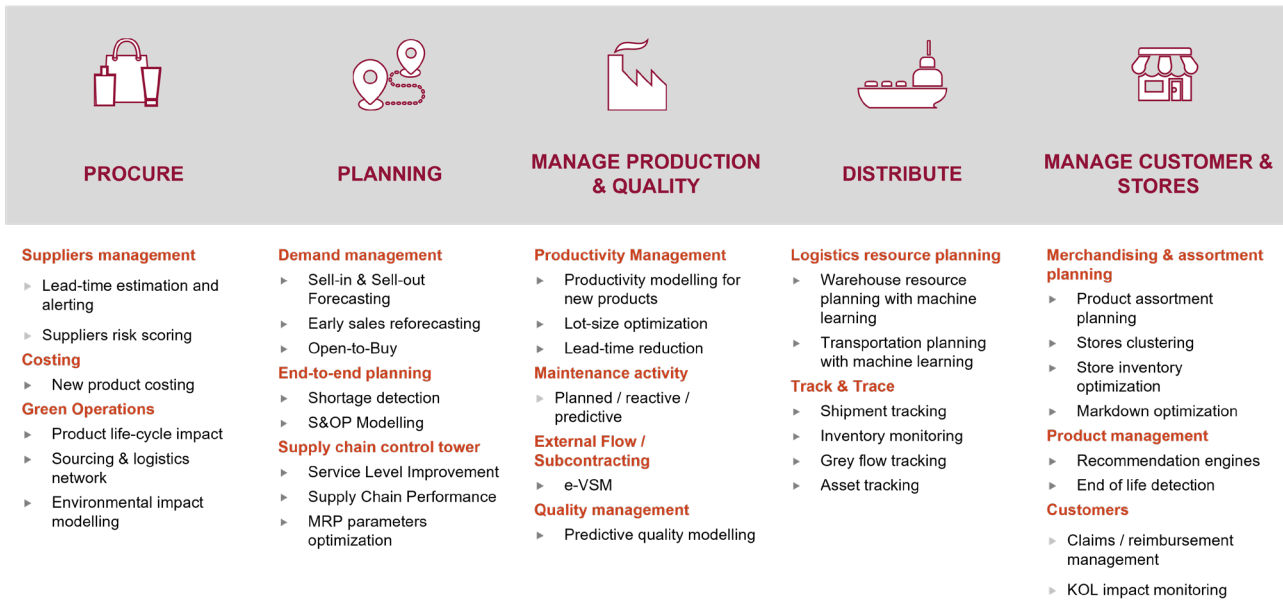
Predictive : e.g. probabilistic forecasting of likely demand quantities for the short-term.

Prescriptive : e.g. recommendation to place an additional purchase order to a secondary supplier, because of (i) probable increase in demand and (ii) predicted delay on primary supplier and (iii) low level of global stock for the corresponding finished goods.

In the examples cited above, it clearly appears that the most mature use-cases combine intelligence from the lower-level applications. However, even the less mature use-cases often show a clear ROI on their own, before serving as a steppingstone towards more advanced applications.

In a more practical way, the following figure illustrates a series of Supply Chain use-cases with Data Science techniques at their heart (this list being neither exhaustive, nor dedicated to a particular industry), which we've encountered and deployed in our client's organizations.

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Selection of Data Science use-cases for the extended Supply Chain

PROCURE	PLANNING	MANAGE PRODUCTION & QUALITY	DISTRIBUTE	MANAGE CUSTOMER & STORES

Suppliers management
▸ Lead-time estimation and alerting
▸ Suppliers risk scoring

Costing
▸ New product costing

Green Operations
▸ Product life-cycle impact
▸ Sourcing & logistics network
▸ Environmental impact modelling

Demand management
▸ Sell-in & Sell-out Forecasting
▸ Early sales reforecasting
▸ Open-to-Buy

End-to-end planning
▸ Shortage detection
▸ S&OP Modelling

Supply chain control tower
▸ Service Level Improvement
▸ Supply Chain Performance
▸ MRP parameters optimization

Productivity Management
▸ Productivity modelling for new products
▸ Lot-size optimization
▸ Lead-time reduction

Maintenance activity
▸ Planned / reactive / predictive

External Flow / Subcontracting
▸ e-VSM

Quality management
▸ Predictive quality modelling

Logistics resource planning
▸ Warehouse resource planning with machine learning
▸ Transportation planning with machine learning

Track & Trace
▸ Shipment tracking
▸ Inventory monitoring
▸ Grey flow tracking
▸ Asset tracking

Merchandising & assortment planning
▸ Product assortment planning
▸ Stores clustering
▸ Store inventory optimization
▸ Markdown optimization

Product management
▸ Recommendation engines
▸ End of life detection

Customers
▸ Claims / reimbursement management
▸ KOL impact monitoring

Data platforms : a stepping stone for use-cases

This use-case driven approach stems from the Data : its existence, availability, quality, and accessibility.

More often than not, we observe a significant gap in organizations between the day-to-day Data Management in place and the requirements of this approach. As such, the Enterprise Data Platform presents itself as an ensemble of concepts and tools working together to bridge this gap, delivering and sustaining business use-cases. Below is our vision of such a platform : combining technological components, supporting teams and the related data governance, acting as the "single source of truth" for all business tools and use-cases.

Key components of the Enterprise Data Platform
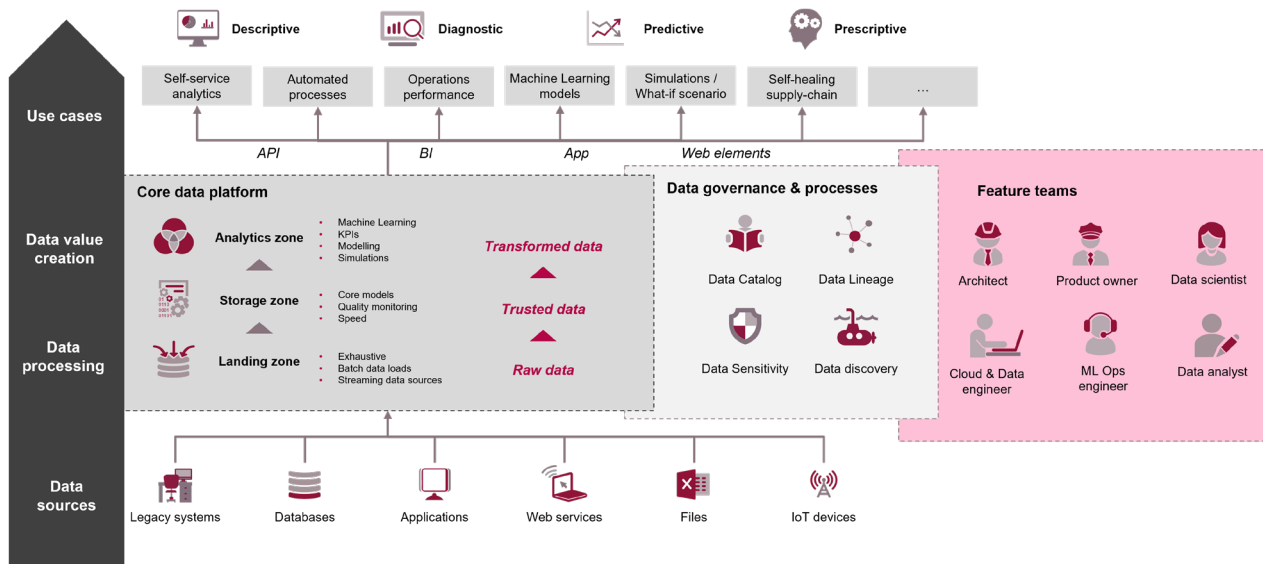
Both Data teams and Supply Chain teams share converging aspirations in the perspective of the Enterprise Data Platform :

- Building a single-source-of-truth for business domains, exposing high-quality data models. For instance, the table object "sales forecast" should be built with the demand planners' expertise and then made

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available to the rest of Supply Chain stakeholders, as well as Purchasing, Marketing, Merchandising, Product Development...

- Connecting to many Data sources, getting the data out of the systems of records, and making it available to a variety of usage. For instance, enabling end-to-end visibility on a global Supply Chain by ingesting data from all the country-level ERP systems.

- Building an abstraction layer between the legacy IT and analytical tools, therefore decoupling software and IT projects from the business side. As an example, an APS tooling can be deployed without having to fully re-design your demand and supply planning KPIs.

Organizational / people consequences

If targeted use-cases bring their own clearly defined ROI, the Enterprise Data Platform also offers the more fundamental benefit of being a practical foundation on which to build a more data-driven culture. In this endeavor, Supply Chain teams can have a head start : after all, data analysis skills are a must-have for such a position and Excel has been the primary weapon of the Supply Chain analyst for decades. Even more so, Supply teams are known for being among the first in the company to setup data warehouses / data lakes and rely heavily on the use of BI tools.

However, there is even more significant value to be captured from offering supply chain teams with highly accessible Data (curated or not) transversal to the company activities, combined with modern and powerful tools to enable flexible data exploration, analysis, and modelling. Under the concept of "self-service analytics" for business users, we identify several tools such as :

- Data Visualization softwares (Power BI, Tableau, Qlikview, Looker...)

- Collaborative SQL editors coupled with notebooks and/or spreadsheets (Databricks, Azure Data Studio, PopSQL...)

- Or all-in-one platforms which can also support AI models deployment (Dataiku, Alteryx, DataRobot...)

What is expected from Data teams is to support the Supply Chain teams on the road to more and more widespread adoption of such tools, with the multiplier effect it will have on the generation of new use-cases and value delivery for the organization. As such, Data Feature teams are responsible for administering the platform architecture itself, monitoring the data quality in the platform (freshness, completeness, validity, coherence), offering training resources to self-service users and building high-value data products.

Delivering this vision requires on a close-knit collaboration between the supply chain teams and their related feature-team :

- On one hand, Data teams can "push" use-cases that are more complex to address, leveraging their specialist profiles (Data Engineers, Data Scientists, UI Expert...). For instance, a machine learning forecasting algorithm for new products potential prediction, or a lead-time prediction model addressing purchase orders to suppliers and subcontractors.

- On the other hand, Supply Chain teams can build their own use-cases on top of data core models made available by the feature-teams. For example, a stock policy simulation model and accompanying stock analysis dashboard.

- Between the two, Supply Chain teams can develop a first version of a use-case, before relying on the Data team to expand its scope and bring it to the expected Data standards for company-wide usage. For instance, a dashboard supporting the S&OP process, first tested on a single business unit before a more widespread adoption.

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Conclusion

The modern Data Stack and Data Science approach have a lot to offer to Supply Chain teams, yielding high value-added use-cases and enabling Supply Chains to become truly adaptative. The Enterprise Data Platform is a vision towards which both Supply Chain and Data feature teams must collaborate. As a Supply Chain practitioner, collaboration with Data teams will help you achieve expected benefits on use-cases of growing complexity, within a long-lasting platform. As a Data Leader, working with Supply Chain teams will drive your roadmap towards a truly end-to-end platform, with opportunities to tackle a variety of use-cases.

At IRIS by Argon & Co, we combine Digital and Data Science expertise with Argon & Co experience in operations and change management. Our 30+ data experts operate at the intersection of operations, technology, to develop disruptive data solutions in Supply Chain, Manufacturing, Merchandising, Procurement, and Finance, from idea to implementation and process transformation.

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IRIS by Argon & Co is an integrated team of operations experts, Data Scientists and Data Engineers within Argon & Co that specialises in Data Analytics for Operations.

We use Data Analytics, AI, IoT and digital technology to design and build clear solutions, and provide a new level of efficiency and profitability for clients. Our people apply a combination of operations experience, data expertise and broad business knowledge to improve operational performance. We deliver robust, transparent and practical data-driven insights and solutions to generate real change.

We are based in Paris, and work collaboratively with the Argon & Co global offices.

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Guilhem delivered Supply Chain transformation projects for several years before joining the IRIS by Argon & Co team as a Data Project Manager. He leads the design, build, deployment and execution phases of data-driven use cases for Supply Chain and Logistics (Business Intelligence, Machine Learning models, Enterprise Data Platforms).

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