

WHITEPAPER

Data science and AI applications

Leveling up supply chain
management

Introduction

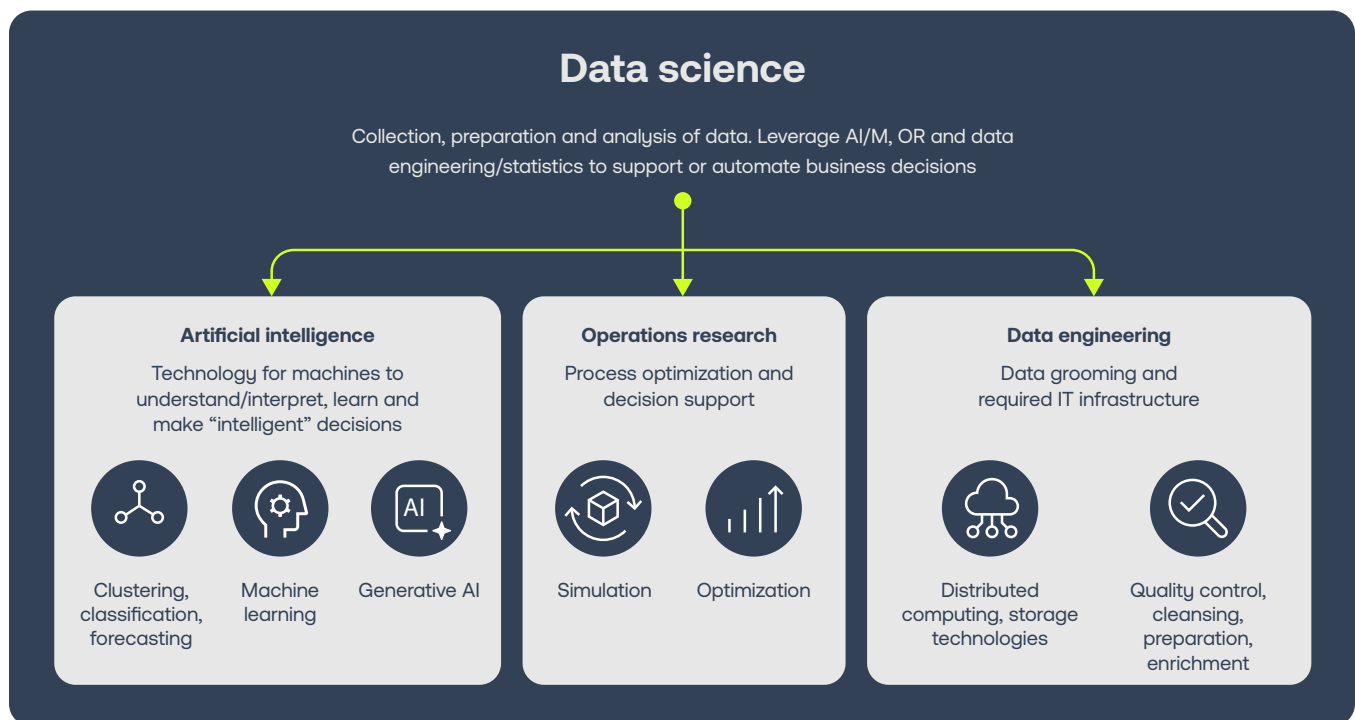
The advent of data science and artificial intelligence (AI) has ushered in a new era of innovation and opportunity for businesses worldwide. The supply chain industry is no exception. As supply chains become increasingly complex and interconnected, the need for continued digitization with smarter, more efficient solutions is key. In their many guises, data science and AI offer huge opportunities for enhancing operational efficiencies, supporting real-time decision making and handling complex data structures in and outside of the warehouse.

Behind the intelligence in AI

As well as processing vast volumes of data at speed, AI methods are capable of interpreting a variety of data types, both structured and unstructured, ranging from text and images to video and voice recordings. Crucially, AI methods can associate disparate data points to decipher complex relationships and perform objective, multi-faceted analyses. For instance, in the retail sector, AI can correlate multi-dimensional data sets with variables such as time, products and locations, providing invaluable insights into anticipated consumer behavior and its implications for inventory management.

These use cases are enabled by data science techniques that span several domains, and are typically grouped into three categories:

- **AI techniques** can be employed to group similar data points together, to categorize data into predefined classes, and to predict future trends based on historical data. They can also act as a generative tool, capable of creating new ideas or solutions based on existing data sets.
- In **operations research**, data science supports process simulation and optimization, providing data-driven strategies and decision support for complex problems.
- **Data engineering** techniques can support data management and quality control. This ensures that data is both reliable and ready for use across a range of applications.



Gauging the limits

However, data science and AI methods are not without limitations. Their effectiveness is highly dependent on the quality and volume of the data fed into them. Poor quality data can lead to inaccurate results, while data privacy concerns may arise from the collection and analysis of copyrighted or sensitive content.

While AI has the capacity to project future outcomes based on historical data, it can sometimes falter when applied to unprecedented situations, such as the COVID-19 pandemic. Another challenge is the potential loss of transparency: as AI models become more complex, understanding the rationale behind their decisions will be essential.

Data science and AI in the supply chain

Supply chain management uses enormous volumes of data, across diverse data types, making it a prime candidate for data science and AI integration. Whether in supply chain execution, warehousing or order fulfillment, AI models are poised to drive competitive advantages for businesses.

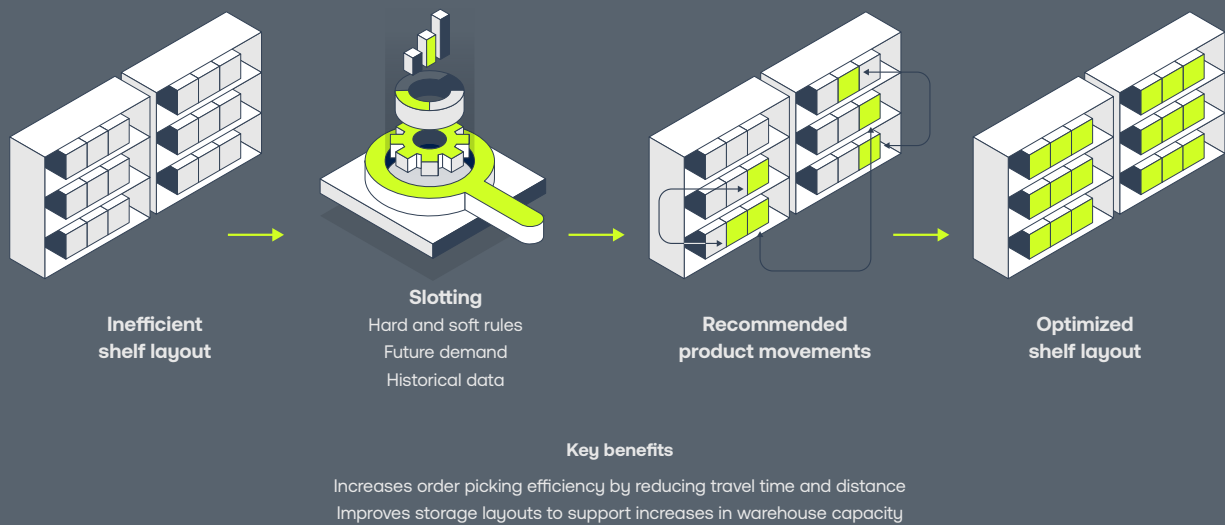
AI is starting to be employed across various systems to enhance operational efficiency, reduce costs and elevate customer and employee engagement. One area where AI can make a significant contribution is in inventory optimization, for example with improved inventory slotting. Another area is shortage management. This could help to break down decision-making silos among production planners, material buyers and suppliers, while fostering collaboration and automating decision making.

Enhancing supply chain planning

Data science and AI are set to revolutionize demand forecasting, integrated business planning and inventory optimization. They could also optimize inventory sourcing in order management systems. AI achieves this by using algorithms that apply various parameters such as lead time, order quantity and safety stock to allocate inventory to orders. AI can also leverage historical data, demand forecasts and supplier performance to enhance these decisions. Additionally, it can strategically allocate resources, offering planners and logistics experts enhanced visibility and risk mitigation.



Data science in practice: Enhancing inventory slotting



Supporting decision making and automation

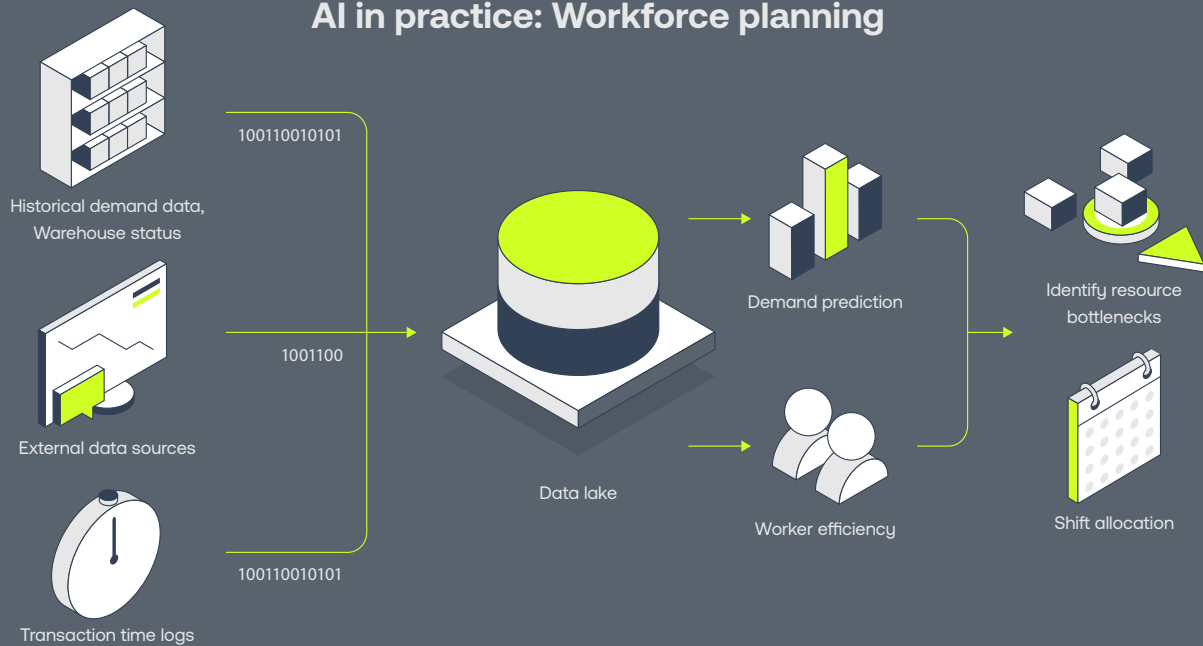
AI plays a pivotal role in automating both micro and macro decision-making processes. By providing real-time analysis and recommendations, it could enhance various aspects of supply chain management, such as asset positioning in transport logistics and optimizing task allocation across automation systems and human labor in the warehouse.

Confidence scoring is another useful tool in the AI arsenal. For example, evaluating procurement actions based on key supply chain performance metrics could help teams prioritize actions for maximum operational impact. Ultimately, the aim is for AI to serve as an agile co-advisor, capable of quickly analyzing and modifying strategies, thereby significantly enhancing operational performance.

Adding predictive performance

AI's ability to transform data into actionable insights and future forecasts is one of its most potent applications. Unlike traditional systems that solely focus on past performance, AI can make logical predictions about future issues and prescribe specific actions. It can forecast with high granularity, considering variables like seasonality, assortment and location, thereby helping to predict transaction times, labor needs, consumer demand, etc. The result is efficiency-driven supply chain analytics and decision support. This could free staff to focus on more complex issues that require human involvement.

AI in practice: Workforce planning



Key benefits

- Reduces labor costs by driving worker efficiency and cutting overtime
- Improves employee engagement through consistent workloads and predictable shift patterns
- Ensures on-time shipping and decreases late fees

Generative AI applications

Generative AI has the potential to redefine key tasks within supply chain management. Example applications span from rapid classification and categorization of data to the automated generation of reports and dashboards—all helping to accelerate manual processes.

Generative AI is also likely to transform the user experience of supply chain software, such as warehouse management systems (WMS). Rather than relying on predefined dialogues and manual data entry, AI-powered tools could facilitate more dynamic, question-and-answer-based interactions. Additionally, AI-enhanced voice-directed work solutions could significantly improve the efficiency of human-centric tasks, such as picking and put-away operations.

Improving data quality

The success of AI in supply chains is due to improvements in data quality. Advances in big data and distributed computing will enable faster and more efficient data processing, which in turn will support more accurate predictive, prescriptive and collaborative analytics. AI-based technologies like natural language processing and machine learning contribute to data accuracy, which is essential to creating reliable and accurate supply chain metrics.

By embracing data science and AI, businesses can not only improve efficiency but also gain a competitive edge. However, it's crucial to remember that successful AI implementation in supply chains involves more than just adopting technology. An initial assessment is essential to identify the most relevant use cases and determine the suitability of AI tools for each individual business. This should be followed by a roadmap for implementation. Additionally, the plan should also include change management strategies and a commitment to continuous learning.

Where next for data science and AI?

As data science technologies continue to evolve, their impact on supply chains is expected to grow exponentially. The future will likely see more advanced AI algorithms capable of more nuanced decision support, further reducing human intervention in routine tasks.

- **Predictive to prescriptive:** While current AI models are proficient in predictive analytics, future models will move towards prescriptive analytics, offering recommendations to handle potential future scenarios.
- **Real-time adaptability:** AI systems will become more adaptive in real time, adjusting to changes in the supply chain environment instantaneously—proving particularly useful in crisis situations.
- **Enhanced collaboration:** As AI becomes more integrated into supply chain operations, we can expect enhanced collaboration between AI systems

and human decision makers. AI will serve as a decision support system, helping humans make more informed choices.

- **Ethics and responsibility:** As AI takes on a more significant role in decision making, companies will need to address ethical concerns like data privacy and drive responsible AI usage.
- **AI-driven innovation:** The future may also see AI-driven innovations in supply chain management, including advances in inventory management, forecasting and even entirely new supply chain concepts.
- **Interconnected AI:** AI will increasingly interact with other emerging technologies like IoT, blockchain and advanced data analytics, creating more robust and resilient supply chain ecosystems.

One source of truth

For AI to be effectively implemented in supply chain applications, a consistent data platform is crucial. It is the only way to ensure that they operate based on a common, consistent set of data.

The benefits of such a unified approach are:

- **One data view:** a common data platform provides a unified view on data, streamlining reporting and analysis across multiple solutions and among multiple stakeholders.
- **One source for data-driven solutions:** a consistent data platform is essential for the data-driven applications in the supply chain, providing access to the most accurate and up-to-date information. It is also a prerequisite for the end-to-end management of supply chains, integrating multiple applications such as order, warehouse, transportation and yard management.

- **One point of integration:** a single place to integrate additional and enrichment data, providing AI with sufficiently diverse data sets for accurate decision making.
- **One face to the customer:** a unified data platform ensures that all supply chain applications ingest data in a consistent manner, resulting in uniform outcomes. This creates a cohesive, end-to-end representation of the entire supply chain operation—e.g., the same inventory levels, shipping statuses, supplier performance metrics, etc.

By adopting a common data platform, companies can ensure that their AI implementations—and the associated business applications—are more effective, reliable and scalable.

Infios data science strategy

To further enhance customer outcomes, Infios has implemented a data science initiative focused on the following areas:



Warehouse management support: Help customers with prominent challenges in the context of warehouse management, such as inventory slotting, labor planning and more efficient order fulfillment.



Data platform: Create a data platform that consolidates data across the Infios product suite, enabling data governance, exploration and consistent reporting.



New features and products: Create additional value by augmenting existing products and developing new data science-based products to support supply chain processes such as forecasting and replenishment.

CONCLUSION

The integration of data science and AI in supply chain management offers unprecedented opportunities for efficiency and innovation. To unlock this potential, it is essential to select the right applications and use cases for each business, implement the solutions judiciously and continually assess their value.

Moreover, a unified, consistent data platform is crucial for maximizing the effectiveness of AI tools, whose success hinge on the quality and volume of data they

process. This will not only fuel more accurate AI-driven solutions but also prove increasingly valuable as supply chains continue to grow in complexity, making the role of AI and data science indispensable in delivering smarter, more efficient warehouse operations.

To discover how our data science and AI solutions can enhance the efficiency of your supply chain operations:

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