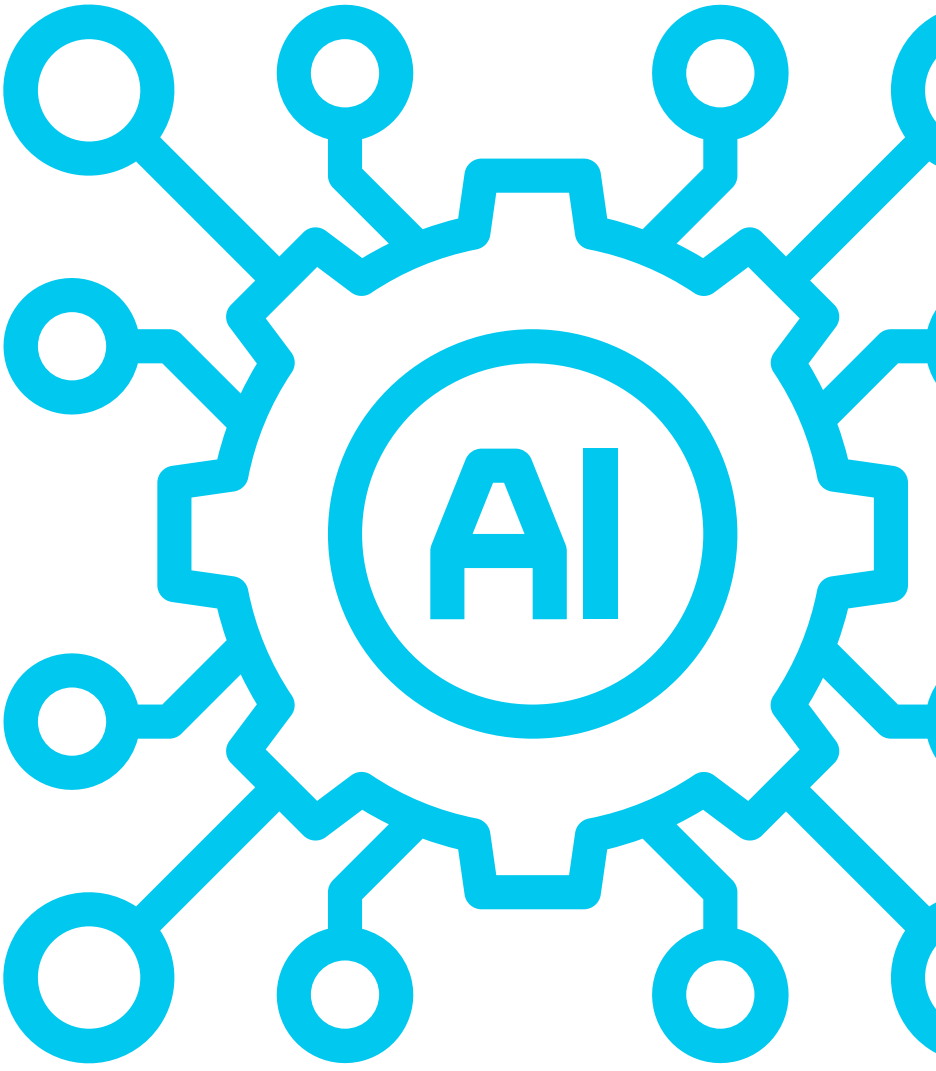
4FLOW
Your supply chain solution

Supply chain's bold new world

AI use cases from chatbots to machine learning

Abstract

This white paper provides a high-level look at the ways artificial intelligence (AI) is already and will continue to revolutionize supply chains in the future. Supply chain professionals will learn high-impact ways to implement AI in their supply chains. We examine key operational activities, including demand forecasting, inventory management, asset maintenance, event prediction and communications, and how these tasks are particularly well suited to AI enhancement. Drawing on 4flow's extensive experience, we present use cases that highlight the tangible benefits of AI integration in supply chains. Furthermore, the challenges and limitations of AI adoption in supply chains are discussed, and solutions to overcome these limitations are explored.



The rise of AI in supply chains

Today's technological advancements put businesses at the crossroads of tradition and innovation. In supply chain management, this tension is particularly strong. As companies navigate logistics, inventory management and demand forecasting, artificial intelligence (AI) emerges as a groundbreaking tool for efficiency and optimization.

In recent years, AI has found innumerable applications in supply chain operations, captivating industry leaders and prompting a shift in supply chain strategies. This rise of AI in supply chains is likely to continue, as the share of supply chain companies that consider AI as critical to their business is expected to grow from 11% to 38%.[1]

AI can be defined broadly, but for the purposes of this whitepaper we understand AI as computer systems that are able to perform tasks that would normally require human intelligence. There are many methods to create AI that is capable of such tasks, such as natural language processing, deep learning or machine learning. Each of these methods has its strengths and is suited to solving different problems. Machine learning, for instance, is currently the most common method employed in supply chain. This is also where 4flow's implementation focus lies.

4flow is a leading global provider of supply chain consulting, software and fourth-party logistics (4PL) services. Our end-to-end solutions help our customers optimize their supply chains to be prepared for the future. 4flow's wide range of products and services offers the right supply chain solution for each individual challenge.

Utilizing AI

Getting started

To begin your AI journey, you'll need a team of domain experts that understand your business, its processes, and your data, as well as data science professionals who can translate business needs into an AI solution. Change management is a key ingredient when implementing new systems. After a successful implementation, the AI solutions work independently, but should be maintained regularly to ensure they react to changes in the underlying business context.

Choosing the correct task for AI

AI is well equipped to solve many issues in supply chains, but it is not applicable to every situation, such as long-term decision making. One example for which AI is well suited are repetitive tasks that are time consuming for a human but can be executed quickly by a computer with today's possibilities of generative AI. Another important use for AI in supply chain is drawing on all available information to infer insights that would not be detectable by a human. This includes tasks like forecasting demands or events, inventory management, or predictive maintenance.

1 https://www.statista.com/statistics/1346717/ai-function-adoption-rates-business-supply-chains/

Gathering the right data for AI

When implementing an AI solution, reviewing your current supply chain data is an important step. The better the data quality, the better the AI solution. Nevertheless, most issues in data quality can be resolved. 4flow has vast experience in data quality enhancement techniques. If, for example, master data is missing or implausible, there are standard methods to estimate the current values.

To define the data that serves as input for the AI model, 4flow applies an iterative process. First, supply chain and data experts define an extensive list of possible relevant information for the system. After a thorough analysis of the importance of the data, a short list is prepared. This data is now fed into the suitable machine learning models for adaption. Throughout the process, feedback from business experts is incorporated and the performance of the AI model is tracked and improved. Each use case for AI requires different sets of data.

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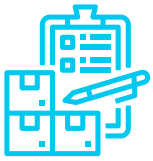


For inventory management:
- Inventory data such as:
  - Stock levels
  - Product descriptions
  - Inventory location
- Sales and demand data

For predictive maintenance:
- Logs on asset use
- Manufacturer recommendations on asset maintenance
- External data such as weather

For event prediction:
- External historical data
- Market data

For demand forecasting:
- Historical demand data
- Contextual data (promotions, holidays, weather)
- Product data
- Market data
- Customer data

It is crucial to consider the unique characteristics of your specific industry while gathering this data. For instance, a business-to-business company may only have two or three large customers with different demand patterns. In such cases, it is beneficial to provide the AI system with customer order data so it can improve its predictive capabilities and account for these customer variations in its demand forecasting strategies. Or, as another example, retail businesses may have products that spoil by a certain date. An AI tool would need data on this spoilage process, and possibly even external data such as weather, so it can best manage the inventory and move the product that spoils soonest before other products.

How to get started using AI in supply chain

There are two approaches to AI implementation: self-service and working with service providers. Service providers such as 4flow bring extensive expertise, efficiency and robust support to the table. Companies that prioritize swift deployment of pre-built solutions, lack data science know-how or value the expertise of external specialists would find this option most suitable.

AI solutions benefit from good data. Organizations planning to implement a variety of AI solutions to become more and more data-driven benefit from use of a digital twin – a supply chain management software that reflects all aspects of the supply chain, including all necessary data. There are a multitude of ways to implement a digital twin. It can be created from the ground up to fit a company's unique needs.

As a leading global provider of supply chain consulting, software and fourth-party logistics (4PL) services, 4flow successfully implements diverse AI solutions in supply chains across industries. In the following sections, we'll take a closer look at supply chain use cases for AI that are already helping businesses streamline operations and improve their performance.

Use case 1

Handling uncertainty with enhanced demand forecasting

Demand forecasting enables supply chains to anticipate and prepare for fluctuations in consumer demand. Forecasts serve as a basis for optimizing inventory management, reducing costs and enhancing customer satisfaction. With its unparalleled ability to understand vast datasets, AI increases the quality of demand forecasting, so businesses see greater benefits of demand forecasting.

Better evaluation of data

AI-powered algorithms can evaluate vast amounts of data more efficiently than humans can. The technology can find patterns, correlations and other insights that may have been overlooked by humans. This ability makes it possible to evaluate various possible demand drivers, including subtle factors that would not have been considered without AI due to the required effort.

Dynamic demand forecasting

For even greater quality improvements in demand forecasting, the abilities of AI go far beyond typical static models. AI can adjust its demand forecast model based on real-time events such as market swings, fluctuating customer demand and supply chain disruptions. Whereas traditional demand forecasting models would fail during such events, an AI-driven algorithm can learn from past data and events and correct the demand forecast in response. It can also use current data to adapt to changes in demand. This method is called online learning and involves AI evaluating data as it is gathered, so learning, adaptation of the model, and decision making are done as quickly as possible.

Significant potential for improved operations with AI in demand forecasting

As an example, 4flow supported a B2C business to increase its revenue by 11% by implementing AI-powered demand forecasting algorithms for cost reduction. Enhanced demand prediction enabled the business to implement an intelligent warehousing strategy. To do this, 4flow first enhanced the business's database with additional internal company data and external data. Then, using machine learning AI to analyze 20 million data fields, 4flow developed an optimized replenishment strategy for this company's warehouses.

In conclusion, AI is exceptionally adept at demand forecasting due to its ability to process and evaluate vast amounts of data quickly and accurately. Properly utilized AI in demand forecasting has the potential to greatly improve supply chain operations: According to one McKinsey study, applying AI-driven forecasting to supply chain management can reduce inventory management errors by between 20 and 50%.[2]

Use case 2:

AI in inventory management

Inventory management is critical to the success of any supply chain, as it ensures efficient allocation of resources, minimizes stockouts and optimizes cash flow, enhancing operational efficiency. For instance, high inventory levels lead to high storage costs, and average rent for storage space has increased by 25% in Germany in the last five years,[3] and in the United States by as much as 38%.[4] High inventory levels additionally lead to product obsolescence and wasted opportunity cost. Businesses should aim to keep inventory at an appropriate level to provide their desired service level while using resources efficiently.

Demand forecasting – an essential part of inventory management

As discussed in the previous use case, AI can increase the accuracy and efficiency of demand forecasting and support decision-making. Proper demand forecasting is a large part of inventory management. With better understanding of future demand, businesses can manage their inventory more efficiently. They can optimize inventory management and reduce carrying costs without increasing the risk of stockouts. Demand forecasting is required for effective enhanced inventory management.

Dynamic inventory management

AI-embedded inventory management systems can utilize online learning, as discussed in the previous use case, to process real-time data from a multitude of sources across a company, such as online platforms, supply chain sensors and point-of-sale systems. Well-integrated AI could seamlessly evaluate this data at a pace that would not be possible for a human.

Many inventory management tasks are already frequently automated, but they are likely done so in a static way that requires manual correction. AI-powered systems that utilize data from a digital twin can monitor inventory levels, track consumption patterns, and automatically generate purchase orders or production plans. By automating these processes so changes are made dynamically as needed, businesses can reduce manual error, streamline operations, and carry the right amount of stock.

4flow has supported numerous businesses to implement AI for dynamic inventory management. In one recent customer project, 4flow supported a retail business to optimize re-stocking of their brick-and-mortar stores.

2 https://www.mckinsey.com/capabilities/operations/our-insights/ai-driven-operations-forecasting-in-data-light-environments
3 Statistics provided by Bloomberg Intelligence (Nov 2022)
4 Statistics provided by BNP Paribas Real Estate (2023)

Previously, the business simply ordered the same products that had been sold. 4flow implemented an AI-powered software to predict products most likely to sell best based on historical and current sales data from similar stores. Orders were then placed using this prediction, instead of re-ordering the same product. As a result, the company increased sales and improved inventory management in their stores, resulting in 11% potential revenue increase.

Reduced costs and improved supply chain flexibility thanks to AI in inventory management

By leveraging AI-based algorithms in inventory management, 4flow supported another customer to achieve a 15% increase in service level with a 30% reduction of inventory. This involved developing demand forecasting algorithms that integrated several forecasting methods, then optimizing inventory and service levels based on that forecast.

AI for inventory management offers a decisive advantage in terms of supply chain flexibility, as it empowers businesses to respond quickly to changes. Improved inventory management enables companies to carry comparatively low stock levels to absorb fluctuations in demand. In turn, inventory reduction creates significant cost savings. According to a study by McKinsey, improving forecasting accuracy by 10–20% and implementing necessary changes can reduce inventory costs by 5%.[5] By harnessing the power of AI, businesses have the potential to greatly improve their inventory management within supply chains.

Use case 3

Keeping supply chains running with predictive maintenance

A common disruptor to supply chains is downtime due to equipment failures. Predictive maintenance helps proactively identify and address potential equipment failures, reducing downtime and optimizing asset performance for smooth operations with minimal disruptions. AI can evaluate sensor and other data in real-time to monitor performance and discover anomalies, which may provide a window into when, where, and why equipment may fail.

Optimal performance

Maintaining optimal performance of machinery and equipment is crucial for supply chain efficiency. AI-powered predictive maintenance systems can utilize online learning to evaluate real-time data from a multitude of sources, including sensors and equipment logs. Additionally, by continuously monitoring key performance indicators in the supply chain's digital twin, such as temperature, vibration and energy consumption, AI algorithms can detect patterns and anomalies that indicate potential equipment failures. With this information, businesses can implement condition-based maintenance, based on the actual condition of machinery rather than on predetermined schedules. Thanks to proactive maintenance, businesses can prevent unexpected equipment failures and minimize unplanned downtime. Predictive maintenance also enables businesses to plan maintenance activities during scheduled downtimes or low-demand periods, minimizing the impact on operations

4flow has experience implementing AI-driven predictive maintenance. An automotive manufacturer was having issues with consistent production stops for a multitude of reasons. 4flow implemented AI-driven software that, by evaluating both historical and real-time data, alerted manufacturing of issues that may cause line stops long before they influenced production.

5 Statistics provided by McKinsey Global Institute

The automotive manufacturer was then able to take action and avoid stoppages, improving efficiency and reducing costs associated with manufacturing downtime.equipment failures dramatically increases supply chain efficiency.

AI-enabled predictive maintenance brings cost savings and greater efficiency

According to Deloitte,[6] predictive maintenance programs that utilize AI bring significant benefits: 5–10% material cost savings, 10–20% more equipment uptime, and 5-10% reduced maintenance costs. These savings and benefits allow companies to plan more aggressively, and minimizing equipment failures dramatically increases supply chain efficiency.

Use case 4

Better preparation with event prediction

In the fast-paced world of supply chain management, accurately predicting events to anticipate and mitigate potential disruptions is a significant competitive advantage. Accurate event prediction enables proactive decision-making and supports continuity of operations to ultimately maintain operational efficiency. With AI, businesses now have a powerful tool to enhance event prediction in the supply chain.

Predictive modeling

AI utilizes algorithms to train predictive models that can predict future events accurately. By learning from historical data, these models can identify patterns and trends and make predictions based on current conditions. AI algorithms continuously improve their predictive capabilities by incorporating new data, enabling supply chains to adapt and respond to evolving circumstances.

Real-time monitoring and alerts

AI can continuously evaluate real-time data from various sources, such as internal sensors and external data feeds, to detect anomalies and trigger alerts when certain conditions or thresholds are met. Real-time monitoring allows supply chain managers to quickly identify and respond to potential events, such as equipment failures, shipment delays or unexpected demand surges. With AI-generated alerts, businesses can take immediate action to mitigate risks, minimize disruptions and ensure smooth supply chain operations.

From reactive to proactive supply chain management

To benefit from more accurate risk prediction, businesses need to make quick decisions to adapt their supply chains. AI that is fully integrated into each facet of the business through a digital twin can seamlessly make and implement such decisions. This enables a more predictive approach to supply chain decision-making, rather than the reactive approach that becomes the default for many organizations – and as such, AI gives companies a competitive edge.

4flow supports its customers to introduce predictive supply chain management using AI. Utilizing external data such as traffic, weather and more, 4flow implemented an AI-driven software for a large food manufacturer. This software predicted delays and exceptions in transport orders that would disrupt the supply chain, allowing the company to proactively solve transportation issues.

6 https://www2.deloitte.com/us/en/pages/operations/articles/predictive-maintenance-and-the-smart-factory.html

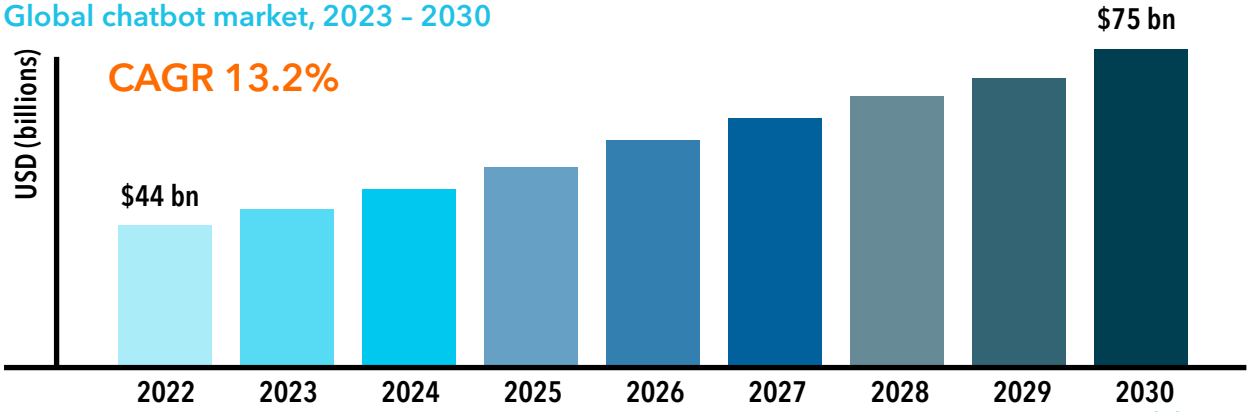
Use case 5

Increasing efficiency with generative AI and chatbots

Generative AI has emerged as a powerful tool for businesses across various industries. Generative AI is particularly well suited to working with text and language, allowing it to automate communication tasks.

In the realm of supply chain management, generative AI is revolutionizing customer service, order tracking, and overall communication. These technologies are impacting supply chains and transforming the way businesses interact with customers, streamline processes and improve efficiency. With the market for chatbots – a popular form of AI that simulates conversation – expanding each year,[7] it is crucial that businesses learn how to best utilize these types of tools.

Global chatbot market, 2023 – 2030



Source: www.fnfresearch.com

Enhanced customer service and collaboration with chatbots

Generative AI in the form of chatbots is reshaping customer service in supply chains. With their ability to understand natural language, chatbots can engage in real-time conversations with customers to address inquiries, resolve issues and provide support. They can provide instant information about product availability, order status and delivery updates, for instance, enhancing the overall customer experience. By automating routine customer interactions, chatbots reduce response times and improve customer satisfaction. AI chatbots ensure round-the-clock support, enabling businesses to deliver efficient and personalized service to customers.

Similarly, generative AI facilitates communication and collaboration between supply chain stakeholders. Generative AI tools can interact with internal teams, suppliers and logistics partners to provide real-time updates, coordinate activities and resolve queries. Chatbots streamline the flow of information in supply chains, eliminating delays and ensuring clear and consistent communication.

AI in action: streamlining customer communication

Generative AI is transforming supply chains by enhancing customer service, streamlining order tracking, providing valuable data insights, and improving communication and collaboration. In a recent customer project, 4flow supported a business to implement a generative AI tool that accurately categorizes the subject of incoming customer emails. These emails are then automatically sent to the responsible party. This reduced delays in communication and streamlined the process for the customer. As businesses increasingly adopt generative AI technology, supply chains will become more efficient, accurate, and responsive.

6 https://www.fnfresearch.com/chatbot-market

AI – a transformative tool for modern supply chains

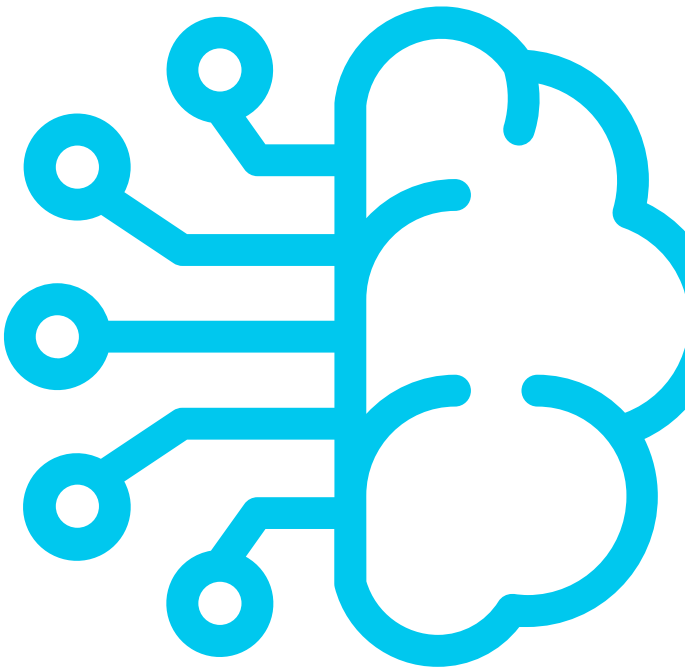
AI is not merely the latest supply chain trend; it is a strategic response to the pressing challenges facing modern businesses. The complexities inherent in global supply networks, coupled with the relentless demand for speed, accuracy and adaptability, have rendered some traditional approaches to supply chain management insufficient.

Looking at the use cases discussed above – demand forecasting, inventory management, equipment maintenance, event prediction and use of generative AI – it becomes evident that AI is a powerful tool with the potential to transform supply chains and drive significant value for businesses in the future.

Interested in AI applications for your supply chain?

Each supply chain challenge requires a unique solution – whether or not it involves AI. Many factors must be considered, such as the complexity of the supply chain, the availability and quality of data, and the organization's readiness for AI adoption.
4flow carefully assesses each organization's needs and capabilities to ensure measurable results and future-ready solutions.

Contact us



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