Unlocking Value, Innovation, and Growth through AI-Driven Supply Chains

White Paper

Contents

Executive summary

This white paper explores the transformative potential of Agentic Generative AI (GenAI) in revolutionizing supply chain processes.

- **Transformative Potential**: Agentic Generative AI (GenAI) will profoundly impact supply chains by enabling autonomous decision-making, real-time risk mitigation, and end-to-end optimizations.
- **Key Capabilities**: GenAI excels at extracting insights from vast amounts of unstructured data, reasoning on this data, and acting on those insights in an automated fashion.
- **Value Impact**: This white paper identifies high-level GenAI capabilities and maps them to their potential value impact across various supply chain processes.
- **Use Cases**: Specific use cases are highlighted, including insight summarization, training assistants, copilots, productivity through hyper-automation, and Agentic AI.
- **Implementation Framework**: A flexible framework is provided to map specific GenAI use cases alongside a classical value/investment matrix.
- **Challenges and Solutions**: The document addresses common challenges in supply chain functions such as S&OP, procurement, and manufacturing, and outlines how AI can provide solutions.
- **Getting Started**: A playbook is included to guide organizations through the implementation journey, from discovering automation opportunities to defining human intervention levels and designing to-be processes.

Introduction

In the face of unprecedented volatility in global supply chains, Agentic Generative AI (GenAI) emerges as a transformative force, enabling autonomous decision-making, real-time risk mitigation, and end-to-end optimizations. GenAI has the potential to remove most or all the limitations of dispersed data in supply chain. It can allow reasoning on this dispersed data, facilitates advanced planning, and can execute actions on behalf of humans at scale and with fewer errors than with manual processes.

In this document, we will:

1. Identify key high-level types of GenAI capabilities to their potential value impact across the supply chain.
2. Define a flexible framework to map specific GenAI use cases alongside a classical value/investment matrix.
3. Call out key uses cases per supply chain functions to help you identify the most relevant to your unique industry business challenges.
4. Provide a playbook to get started in this implementation journey.

Identifying GenAI capabilities potential value impact

GenAI is particularly good at extracting insights from vast amount of unstructured data. If properly grounded, it can reason on this data and act on those insights in an automated fashion.

These capabilities are applicable across a wide range of business processes within a company. Not all processes will benefit equally from integrating GenAI or redesigning them from scratch with GenAI in mind.

Exhibit 1 on the next page summarizes the potential value AI, based on our analysis of the typical ways it could be applied in supply chain processes.

Exhibit 1: AI agents – potential in Supply Chain

Gen AI features	Potential for value unlock across Supply chain
Automated insights from structured & internal databases	★★★★★
Summarized & integrated insights from internal & external	★★★★★
Recommendations / actionable AI	★★★★★
Automated insights from external databases / subscriptions	★★★★☆
Triggering workflows	★★★★☆
Deliver on demand insights through conversational ai	★★★☆☆
Content generation / collation of insights in PDF / PPT / email formats	★★★☆☆
Continuous monitoring for anomalies	★★★☆☆
Automated reading of calendars & emails	★☆☆☆☆

This is a snapshot of the current and expected capabilities of AI tools as of early 2025. As AI gets more sophisticated, it will be able to drive business value from not just making transactional tasks more efficient, but also by making human decisions more automated and effective.

Mapping GenAI capabilities to Supply Chain processes

GenAI typical horizontal capabilities, as described in the previous section, can be roughly bucketed into five types of approaches with varying degrees of potential value impact and technical implementation complexity.

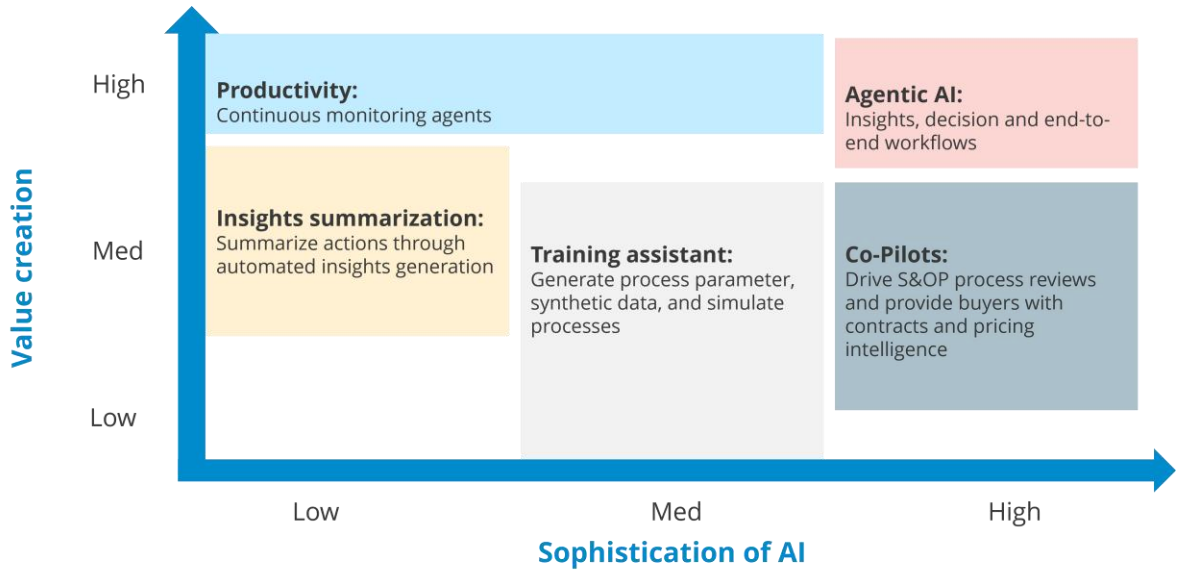
1. **Insight summarization** is one of the most common uses of generative AI tools. It is relatively easy to implement and can still have a measurable impact on value creation. For instance, it can summarize actions by generating insights from data points across various supply chain functions and processes such as ERP, WMS, TMS, and CRM.
2. **Training assistants** can help generate process parameters, synthetic data, and simulate processes across factory shop floors, warehouses, and overall supply chain operations.
3. **Copilots** are tools that work together with supply chain operators and managers by providing them with support (information, coaching, insights) alongside their existing workflow. For instance, it can drive pre- and executive reviews of sales and operation planning (S&OP). It can also enable buyers with insights summary and price recommendations on contract and purchase orders.

Those first three types of AI implementations will bring low to medium value to companies. The next two have the highest potential to bring lasting high value to supply chain operations.

4. **Productivity through hyper automation** will enable continuously monitoring agents across procurement, customer service, manufacturing, and inventory to ensure adherence to procedures, quality, appropriate training, and overall efficiency and efficacy. Its implementation is quite simple for the value it can bring.
5. The final type of generative AI implementation is the one that probably has the most exciting potential**: Agentic AI**. With agentic AI, companies can deploy virtual employees that can generate far reaching insights and manage workflows end to end whether they are in S&OP, procurement, or merchandising.

Exhibit 2 summarize those four buckets of implementations across the two dimensions of value creation and technical complexity.

Exhibit 2: Value creation in Supply Chain through GenAI



Let’s be specific: How AI reimagines supply chain processes

AI can drive autonomous processes across the entire spectrum of the supply chain process: Plan, Source, Make, and Deliver.

Sales, Inventory and Operational Planning

Challenges

S&OP faces several issues. First, fragmented functional insights due to information silos hinder the seamless flow of information across departments, leading to inefficiencies and misaligned strategies. Then, manual data collection and analysis cause significant productivity loss, consuming valuable time and increasing the likelihood of errors.

There is also often a lack of cross-functional alignment in the S&OP process, resulting in conflicting priorities among departments. Also, limited predictive capabilities impacts effective risk planning and response scenarios. Lastly, inadequate on-demand insights mean decisions are potentially based on outdated information.

AI value & potential impact

An AI solution can be designed to collate and organize cross-functional S&OP insights tailored to specific functional roles. It can predict risks, including "Demand at Risk" and "Capacity White Spaces," providing a comprehensive view of potential challenges.

Also, it can provide early warnings for proactive risk mitigation, enabling the organization to address issues before they escalate. Finally, it empowers users to dive deep into insights in real-time and in plain English, which facilitates informed decision-making and enhances operators’ efficiency.

In planning-led use cases, agentic frameworks have helped increase revenue through early risk identification and proactive mitigation. They have also accelerated decision-making by combining human judgment with real-time AI support.

Procurement

Challenges

One of the primary issues in procurement is the disjointed information flow caused by disconnected systems, preventing comprehensive supplier assessment. This lack of integration impacts the ability to make informed decisions and assess suppliers effectively. Additionally, resource-intensive processes, particularly manual workloads,

restrict strategic negotiation opportunities. The time and effort required for manual data handling limit the capacity to engage in more strategic and value-driven negotiations.

Also, the reliance on reactive decision models limits the inclusion of market shifts and supplier developments. This reactive approach means that the organization is often playing catch-up rather than proactively addressing changes in the market.

Lastly, there is a significant vulnerability exposure due to inadequate safeguards for sensitive negotiation data, which can lead to potential competitive disadvantages. The lack of robust security measures puts critical information at risk, potentially compromising the organization's competitive edge.

AI value & potential impact

AI solutions can be designed to collate negotiation insights across contracts through AI-driven pricing analysis. It can automate decision support by leveraging market data and intelligence, ensuring that decisions are based on the most current and relevant information. Also, it can implement benchmark analysis for quick price adjustments, allowing for more agile and responsive pricing strategies.

In addition, those AI solutions can democratize insights by creating a centralized repository categorized by spend, making it easier for users to access and leverage the information. Lastly, it can assist with contractual interactions through conversational AI.

Across the industry, agentic AI implementations have shown clear value by improving sourcing efficiency, boosting buyer productivity, and reducing leakage across indirect spend.

Manufacturing

Challenges

Proactive risk identification and failures root causes analysis are critical in managing and preventing machine failures.

Often, these failures are detected only after they occur, requiring significant manual effort and multiple data sources to identify the root cause. This reactive approach is inefficient and time-consuming. Additionally, there is limited visibility into historical actions taken for similar failures and the impact of downtime due to repairs or replacements. This lack of historical insight hampers the ability to plan effectively for future incidents.

As breakage will always happen, timely availability of spare parts is essential for minimizing downtime and total cost of resolution (including manufacturing time loss).

Without a reliable system to ensure the availability of necessary parts, organizations face prolonged disruptions and increased costs. Addressing these challenges requires a comprehensive approach that integrates real-time data, predictive analytics, and efficient resource management.

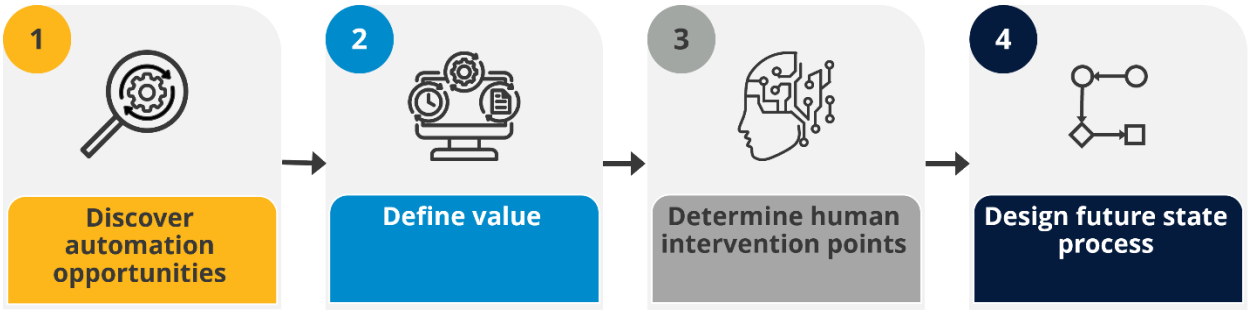
AI value & potential impact

An AI solution can facilitate intelligent conversations with machine logs and process parameters data. It extracts key insights and summarizes process steps, critical process parameters, and potential failure reasons.

Then, by analyzing historical data, an AI solution can devise the best possible actions and can assess the corresponding impact on cost, downtime, and personnel requirements.

Finally, it can explore spare parts availability and recommend optimal re-order points based on historical consumption and the current machine status.

Getting Started with AI driven automation



Phase 1: Discover Automation Opportunities

Process Mapping and Baseline Analysis

The discovery phase begins with a comprehensive audit of existing supply chain workflows. Process mining tools, using value stream mapping techniques, are deployed to visualize end-to-end operations, from procurement to last-mile delivery.

Stakeholder-Driven Pain Point Identification

Cross-functional workshops with procurement, logistics, and warehouse teams are conducted to identify operational bottlenecks. These are analyzed along with process mapping outcomes to identify high impact automation opportunities.

Phase 2: Define Value Proposition and Prioritization

Define Business Case

A comprehensive business case is created that not only looks at the efficiency gains in terms faster turnaround time, but also in terms of better user experience and improved effectiveness of business processes.

Identify Implementation Feasibility

Implementation feasibility is assessed through technical feasibility, security, data readiness and organizational readiness, regulatory compliance and scalability potential.

High-priority initiatives are fast-tracked for prototyping, while others enter a governance backlog for post-milestones reevaluation.

Phase 3: Define Human Intervention Levels

The level of automation is defined to finalize the protocols that would define the design of to-be process. This is dependent on the following parameters: AI results accuracy, regulatory and compliance requirements, expected business impact, current level of human effort and accuracy.

1. Fully automated: AI driven processes with zero human oversight, e.g. Automated Palletization.
2. Machine-dominant with human validation, e.g. dynamic safety stock levels
3. Human-led with AI assistance, e.g. Contract negotiations
4. Exception-handling workflows: Escalation paths when AI confidence scores are below defined threshold.

While defining the human intervention levels, an assessment is done to identify reskilling needs. This includes data literacy, digital acumen to manage human + machine automation orchestrators.

At this stage the change management is also initiated that addresses the cultural resistance by demonstrating AI's role as a collaborator rather than displacer.

Phase 4: Design To-Be Processes and Implementation Roadmap

Future-state workflows embed AI as a core component. Proof of concept MVPs are scaled for a small business unit / geographic unit to completely define the To-Be process. The implementation roadmap is defined based on the value potential and the AI sophistication.

Quick wins with time to value of less than 6 months are prioritized. These are followed by more transformative initiatives that can take up to 18 months.

To be successful, it's important that the design is followed by an agile implementation approach to deploy, optimize and scale the initiatives.

At this stage, value tracking must also be initiated to measure the impact against the established business case.

Conclusion

The integration of Agentic AI into supply chain processes offers significant potential for value creation and operational efficiency. By leveraging GenAI's capabilities, organizations can overcome traditional limitations, enhance decision-making, and drive innovation across the supply chain.

By leveraging these white paper concepts, you can build a comprehensive roadmap for implementing AI-driven automation. This will ensure that you can successfully and effectively deploy AI solutions at scale in your supply chain processes.

Learn more about Fractal supply chain solutions at fractal.ai/supply-chain

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