The Importance of AI in Supply Chain and Operations

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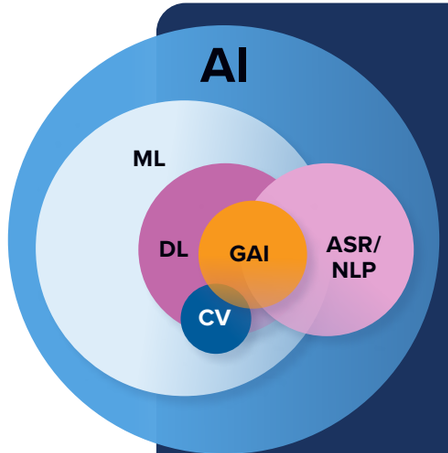
AI Everywhere — Focusing the Spotlight Across the Supply Chain and Operations

Context

With intelligence becoming the primary source of value creation, we are on the verge of the "Intelligence Revolution," where artificial intelligence and automation-oriented technology will be the main accelerators of business change. In the realm of "AI Everywhere," generative AI emerges as a transformative force, potentially revolutionizing the future. This branch of AI enables the machine-driven autonomous creation of new content, from images to music and even written text, with remarkable accuracy. Early applications of generative AI have showcased its potential in fields such as the creative arts, content and code generation, and personalized recommendations. However, it also raises concerns regarding bias and privacy: AI algorithms can inadvertently perpetuate biases and pose threats to personal data. As a result, regulation is crucial to ensuring the responsible and ethical use of generative AI. Despite these challenges, the possibilities are vast, ranging from improved customer experiences to innovative problem-solving. Harnessing the power of generative AI and navigating its associated complexities could shape the future of industries and drive advancements in the AI-driven world.

Modern cloud applications, including cloud ERP, are an important precursor for extracting full value from AI use cases and enhancing the ability for supply chains to remain nimble. In the IDC 2024 Supply Chain Survey, 48% of respondents cited legacy/on-prem systems, or integrations to these systems, as major impediments to their ability to respond to disruptions.



- Artificial Intelligence (AI)
- Machine Learning (ML)
- Deep Learning (DL)
- Automatic Speech Recognition, Natural Language Processing (ASR/NLP)
- Generative AI (GAI)
- Computer Vision (CV)

IT Impact

Businesses are already jumping to get a piece of the AI pie, afraid to miss out on the opportunities it presents. Though we are in the early days, monetization and the scale of AI solutions are expected to evolve rapidly. However, this comes at a time of relative economic uncertainty and increasingly constrained IT budgets. AI is not without risks, especially when it comes to ethical AI and data privacy, and companies need to carefully consider the best use cases to implement AI effectively.

AI Everywhere and the Emergence of New AI Use Cases

IDC defines a use case as a technology-enabled, business-funded initiative that delivers a measurable outcome. There are three broad types of AI use cases as highlighted below:

Productivity use cases are aligned to work tasks such as summarizing a report, generating a job description, or generating code in Java. AI functionality for productivity improvement is being infused into existing applications.

For many of these use cases, it is possible to deliver business value purely through the content and data that the underlying foundation models have been pre-trained. Foundation model providers themselves (have already seen success with this approach.

Business function use cases tend to integrate a model (or multiple models) with corporate data for use by a specific department or function (marketing, sales, procurement, etc.). Many organizations are testing these types of use cases but are concerned about intellectual property leakage and data governance.
These business-function use cases require integration with established enterprise applications and platforms from vendors such as Salesforce, Oracle, SAP, ServiceNow, Sage, Workday, Informatica, Appian, Pegasystems, and UiPath. Their capabilities will need to reference or be constrained by their clients' business data (customer data, product data, knowledge bases, etc.).

Industry use cases will generally require more custom work (and, in some cases, may even require building your AI model). Examples include generative drug discovery in life sciences and generative material design for manufacturing. These are likely to be a source of real business value creation for larger enterprises that can put together a sufficiently large set of training data or work with other parties in their ecosystem to share data to train the model. These specialized use cases tend to be built around very specific choices of models and model providers, with custom integration architectures designed for individual clients and significant custom implementation work required.

There is a mix of internally and externally facing use cases, each with its level of potential risk and business impact that requires incorporation into a use-case prioritization framework for any organization kickstarting its AI journey.

3 Key End User Questions

Is my data in good enough shape to take advantage of AI?

"We are concerned that the quality and reach of our current data will mean that our efforts to implement AI will either fail or be marginalized. Do we need to improve our data before diving into AI and GenAI more broadly?"

— CSCO, CPG Manufacturer

Should I be a leader/ early adopter, or is being a fast follower a better strategy?

"Is there a first-mover advantage to investing in AI, or will the initial costs of training models or adopting immature tools mean that leaders will end up being too expensive?"

— Director SC Planning, Hi-Tech

How should I be thinking about AI — as part of the analytics "layer" or embedded within functional applications?

"We think of AI through the lens of key supply chain use case. How should we be thinking about adoption — as part of traditional supply chain tools such as demand planning or as a layer within control towers or the supply chain digital twin?"

— VP of Logistics, Automotive Supplier

AI Strategy Within the Supply Chain and Related Operations

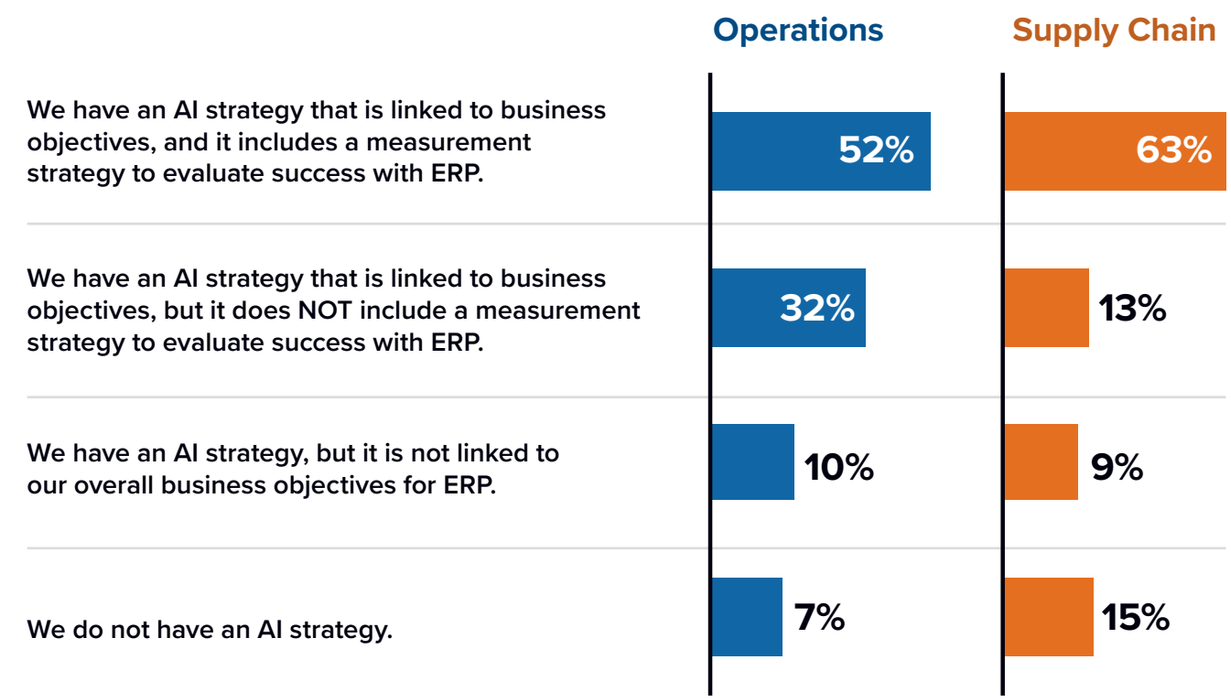
Priority business outcomes are:

- Operational efficiency **(26%)**
- Business resilience **(25%)**
- Improved employee productivity **(24%)**

Companies say they will spend **$13 million on AI-powered ERP projects** within the supply chain and operations over the next 12 months, with an additional $155 million the year after that.

Supply chains cite **advanced analytics/ AI as the most important technology investment** over the next three years (2024 IDC SC survey).

Which of the following best describes how your organization's overall AI strategy, including traditional AI and generative AI, supports/will support your ERP business objectives?



Source: *IDC Cloud as the Platform for AI Innovation survey*, November, 2023

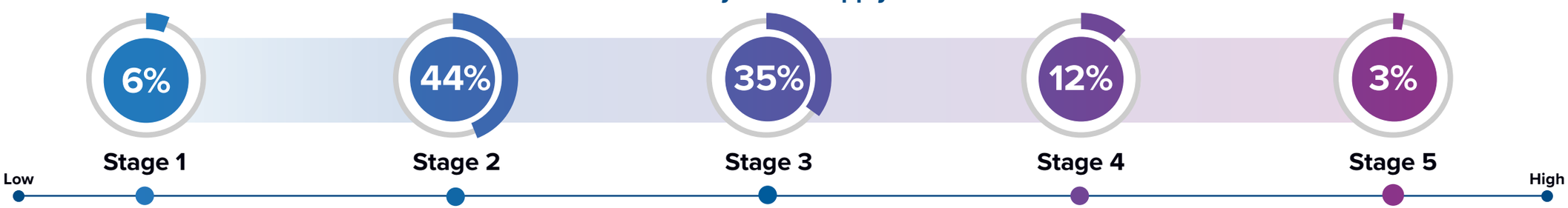
The Importance of the Data

At the heart of successful AI implementations is the data, both in terms of the quality of the data and the supply chain/operations having enough to properly train the models. As companies progress through the data maturity levels, AI performance should improve.

How companies look at where data should be managed depends on the kind of data. It is best to manage the collected, analyzed, and used data locally at the edge and globally manage data that is more broadly collected and/or analyzed and acted upon centrally.

Supply chains will also have to consider how and where data is accessed and in what form it initially presents (electronic, paper, etc.).

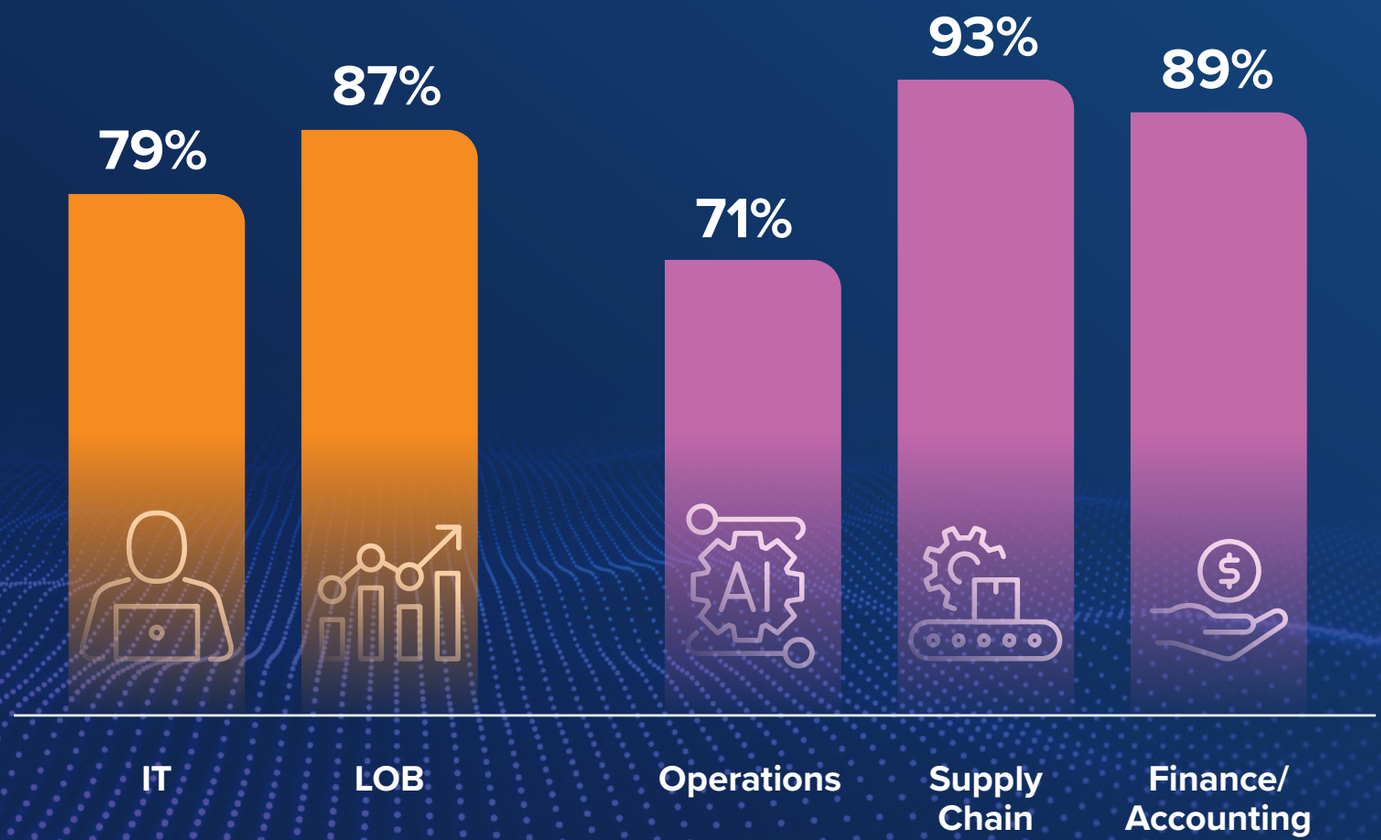
Data Maturity in the Supply Chain



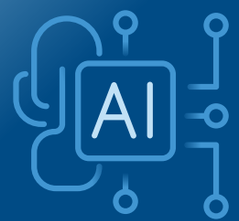
Source: *IDC Supply Chain MaturityScape Benchmark 2023*

Data Privacy

How important is data security and privacy in AI-powered ERP software delivered by the ERP vendor?



Leader/Fast Follower



The future is NOW

Begin to explore how AI tools can help with productivity and performance across your supply chain without delay. Tools are already available to provide support across a broad range of supply chain activities, even if data quality and process integration require some additional effort. Although GenAI tools will certainly evolve, the immediate insights gained and learnings for future implementations will outweigh the work "wasted" training older tools.

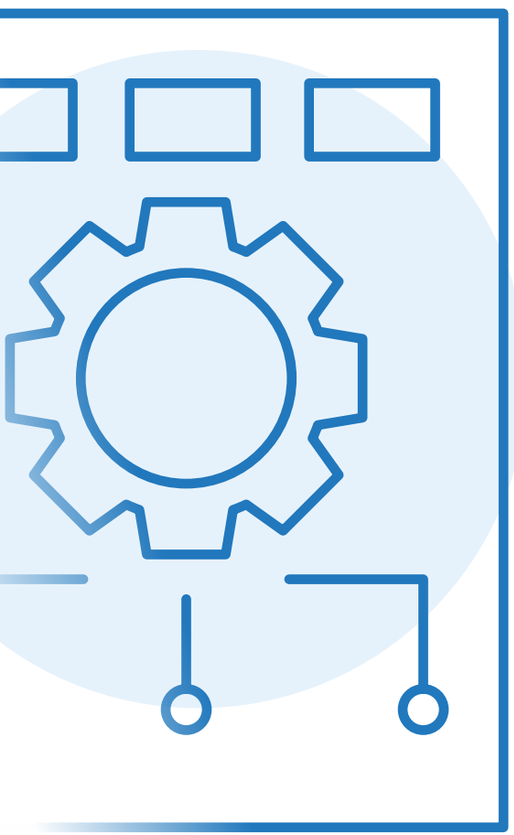
Grow AI expertise

Identify internal roles for AI innovation and transformation. Establish partnerships with technology providers and system integrators that understand your company, the supply chain, and the industry. Facilitate the sharing of goals, capabilities, and values across the product development ecosystem.

AI risks and security

Implement AI data governance standards to reduce potential biases (e.g., training data diversity) and improve data privacy. Enforce robust security measures to protect against breaches with the continuous monitoring of the model and output and ensure compliance with legal and ethical norms. Have Multi-disciplinary teams should perform regular audits of large language model (LLM) decisions and outcomes to identify and correct biases that arise over time.

Embedding AI into the Business Process and Key Applications: **Supply Chain Planning**



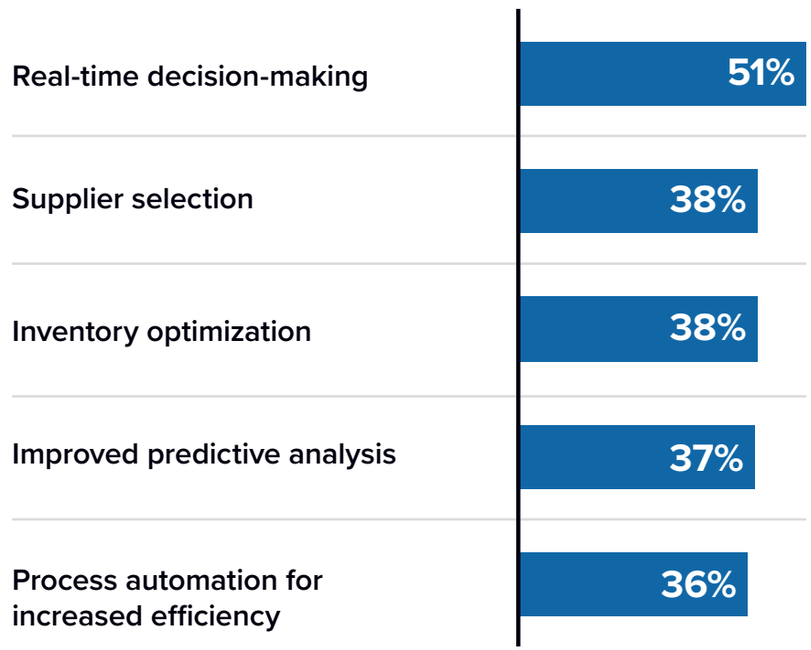
The acceleration of decisions and elimination of latency

The enabling of direct material supplier selection/ alternatives in the event of disruption

Inventory that works more efficiently and effectively

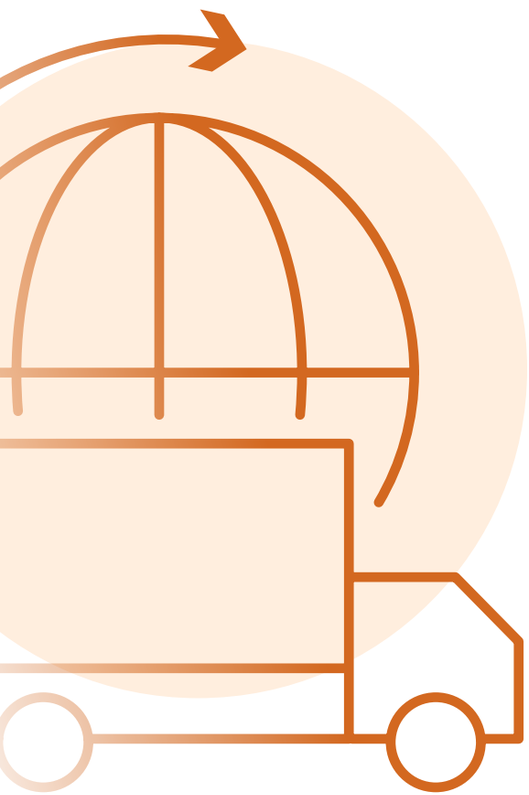
Process automation as the aspirational capability (54%) for supply chains not currently using AI for planning

What are the top 2 expected benefits in using AI for your supply chain planning processes?



Source: *IDC Cloud as the Platform for AI Innovation survey*, November, 2023

Embedding AI into the Business Process and Key Applications: **Supply Chain Logistics**



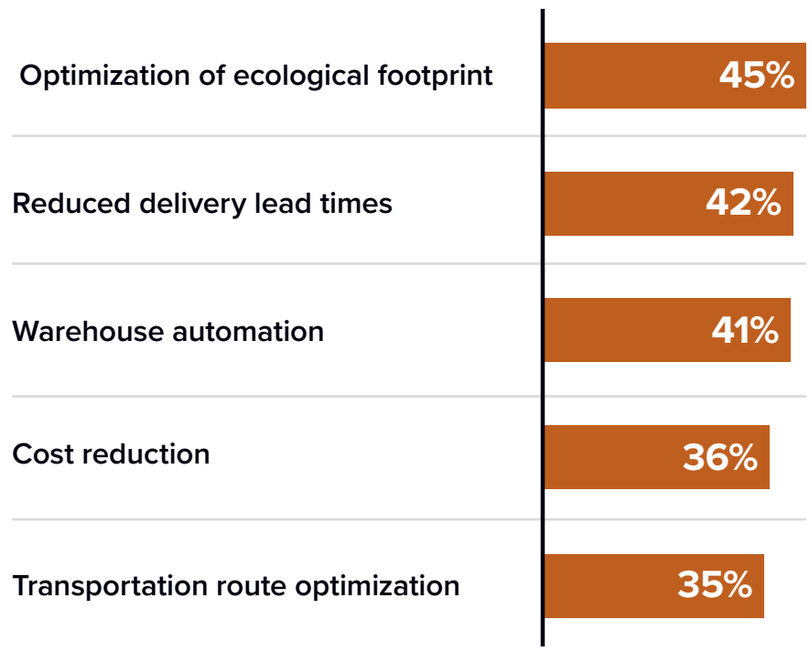
Important enabler of operationalizing sustainability

Optimization of delivery lead times while reserving asset usage efficiency

Warehouse worker shortages leading to the use of AI tools to enhance productivity

Route optimization as the aspirational capability (48%) for supply chains not currently using AI for planning

What are the top 2 expected benefits in using AI for your supply chain logistics processes?



Source: *IDC Cloud as the Platform for AI Innovation survey*, November, 2023

Embedding AI into the Business Process and Key Applications: **Manufacturing/Operations**

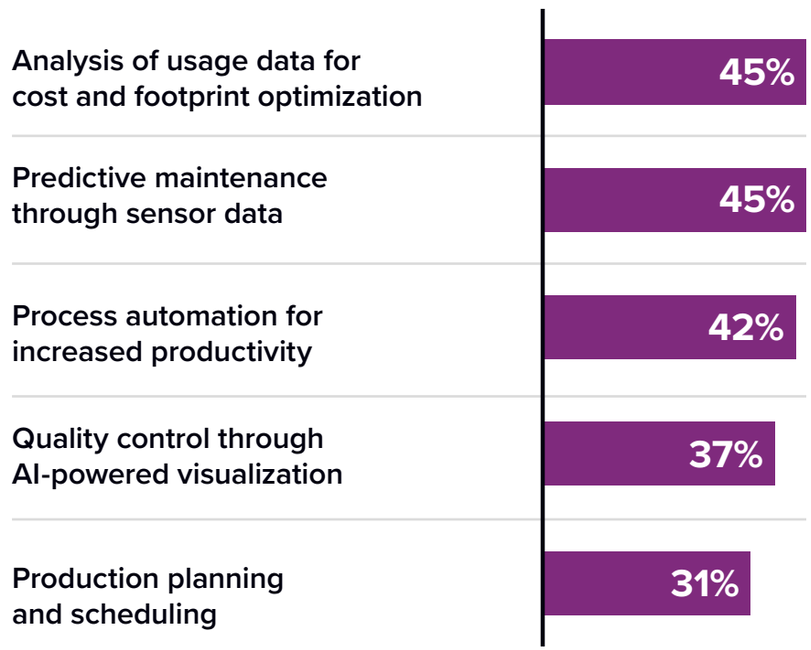
The driving of efficiency and waste elimination

The driving of asset performance with real-time, iterative predictive maintenance (for IoT native and retrofit assets)

Labor/skills shortages in the factory putting pressure on process automation to augment people and accelerate time to expertise

Visualization tools to recognize and contain/constrain poor quality creep

What are the top 2 expected benefits in using AI for Manufacturing?

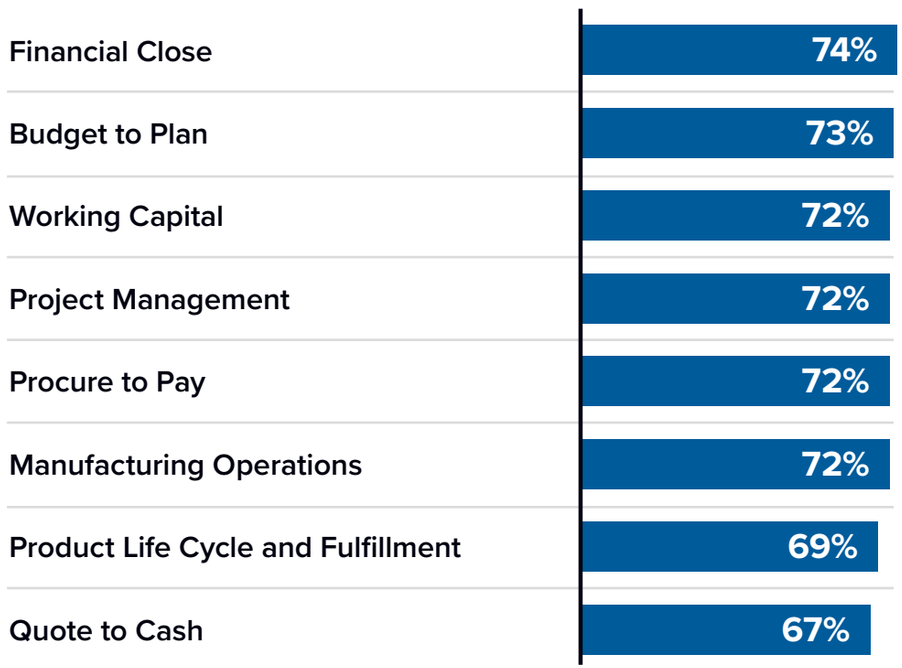


Source: *IDC Cloud as the Platform for AI Innovation survey*, November, 2023

Business Process Importance and Alignment

- **Key priority AI business processes for supply chains include manufacturing operations, management of working capita**l (mainly through the lens of inventory management), and procure to pay, particularly for direct/ complex procurement.
- **Using AI to help align product life cycles, particularly later-stage capabilities for manufacturing scalability and fulfillment**, remains a challenge for most supply chains.
- **Although project management tends to focus on specific/discrete efforts, linkages to factory efficiency, availability, and inventory availability** connect back to the supply chain.

In your opinion, how important is AI to the following?

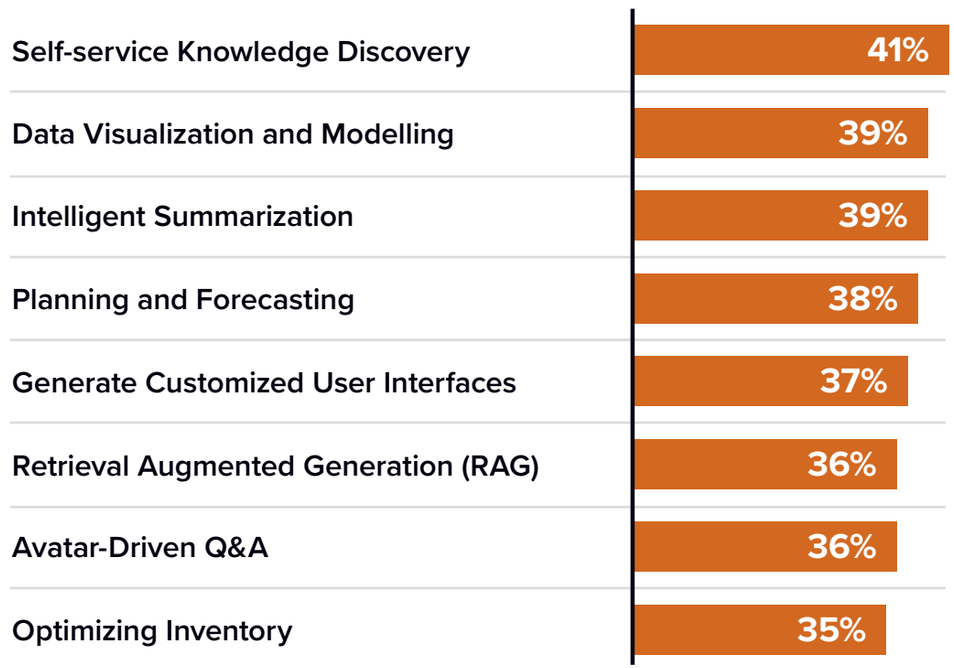


Source: *IDC Cloud as the Platform for AI Innovation survey*, November, 2023

AI High Priority Use Case Areas

- The pace of the supply chain means that **operations people need to be able to quickly identify and assess the impact of data through self-service knowledge "discovery."**
- **Data visualization and modeling help supply chains and operations make sense of data quickly and in a people-intuitive way.** Data-driven decisions in real time mean better performance and reduced decision risk.
- **Supply chains and related operations are often "buried" in unstructured data, such as manuals, goods receipts, and invoices.** Intelligent summarization means more easily ingesting these materials and improving productivity and output.
- **Planning/forecasting remains a major source of frustration for the supply chain and related operations.** The view that better and quicker use of data is broadly held.

Which of the following use cases/ use case categories are the highest priority for AI-powered ERP?



Source: *IDC Cloud as the Platform for AI Innovation survey*, November, 2023

Use Cases in the Supply Chain by Sub-Segment

Planning/Forecasting

- Dynamic Demand Forecasting and Inventory Management
- Supply Chain Orchestration
- Enhanced Risk Management and Identification

Network Design

- Service Level Agreement Optimization and Insight
- Supply Chain Network Design
- Supply Chain Carbon Footprint

Warehousing/Inventory

- Automated Inventory Replenishment
- Workforce Planning/Labor Forecasting
- Order Picking/Slotting

Factory Floor

- Asset Maintenance
- Visual inspection
- Agile Production Planning

Logistics/Global Trade

- Optimizing Load Balancing and Distribution
- Automated Customs Clearance
- Freight Volume Forecasting

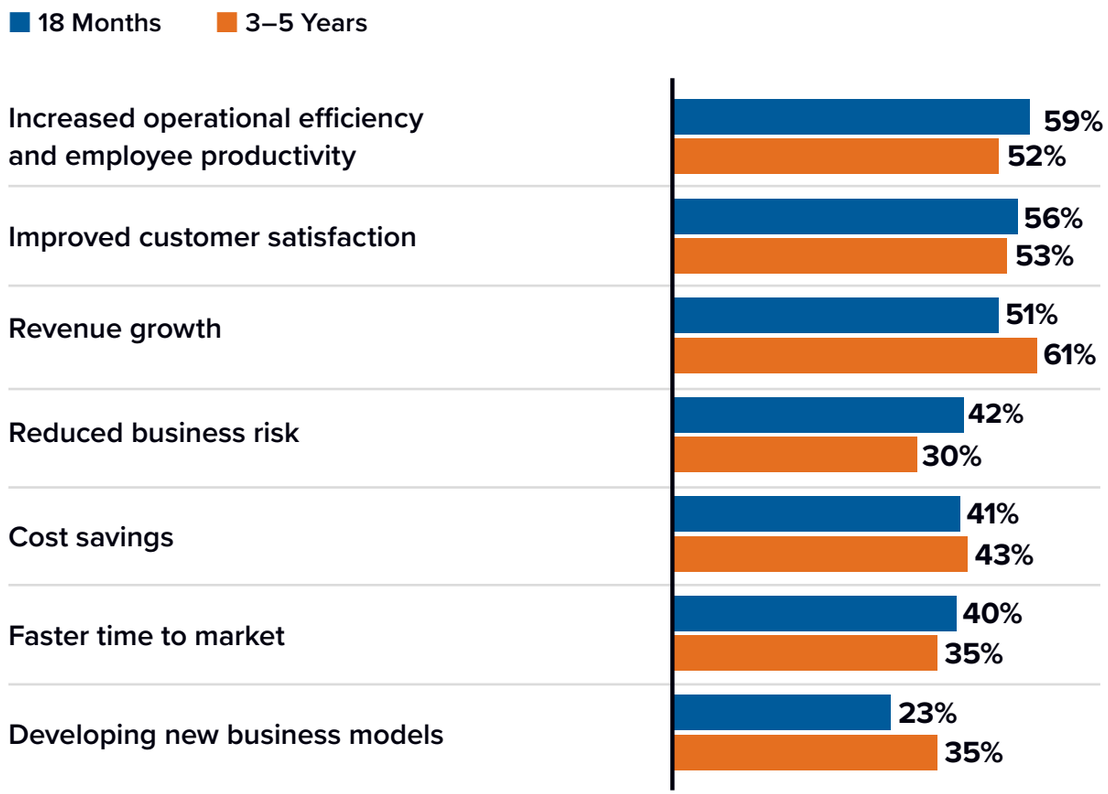
People Productivity

- Asset Operation Optimization
- Employee Augmentation — Task Automation
- Accelerated Time-to-Expertise

Assessing AI Value/Business Outcomes

- **The initial lens for AI has been one of productivity and operational efficiency**, including higher machine/asset utilization, quicker time to productivity for new employees, and task relief for established ones.
- **In many instances, processes that were previously aspirations can now be practical.** Examples include dynamic inventory deployment, real-time demand forecasting, and operational offsetting.
- It must be about the use case. **How does AI help to solve problems or take better advantage of opportunities?**

Which of the following are the three most important business outcomes that your organization is trying to achieve from leveraging AI, including traditional AI and generative AI, for ERP?

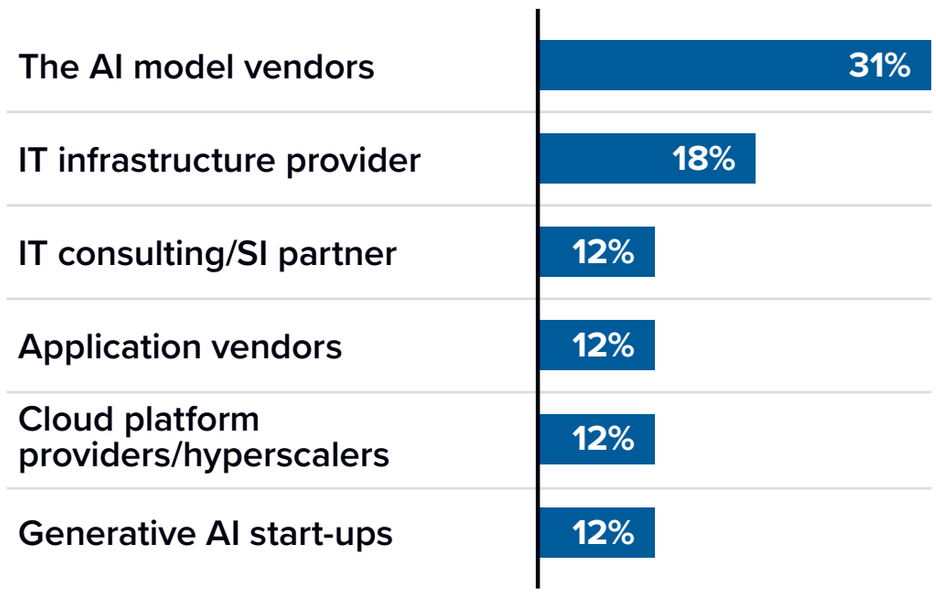


Source: *IDC Cloud as the Platform for AI Innovation survey*, November, 2023

Who Is the Expert?

- **The AI model vendors are today's "bright, shiny objects," but in the long run, application vendors will be the better source for AI tools**, as they understand the business process and are aware of how enabling technologies will work most effectively.
- **IDC expects to see AI increasingly embedded in specific applications**, including supply chain planning, transportation, and logistics, rather than a "layer."
- **It will be about operationalizing AI within the business and specific functions** to the point where the line-of-business user may not even realize that AI is being used. It simply helps them do their jobs more effectively.

Where are you currently looking for AI advice and tools?



Source: *IDC Cloud as the Platform for AI Innovation survey*, November, 2023

AI Use Cases for Supply Chain Planning and Forecasting

Dynamic Demand Forecasting and Inventory

Leverage standard (numeric) and non-standard (LLM) data to better derive forecasts, inventory plans, and strategies. The combination of AI, LLM, and ML will enable advancements in modeling and selecting demand and inventory plans and support scenario modeling and IBP decision-making (e.g., sales investment, promotions and pricing, and manufacturing investment).

Supply Chain Orchestration

Leveraging LLM/unstructured data, SCO tools will be able to support the integration of information across all silos of the supply chain and connect internal and external data. By integrating standard data (e.g., track and trace, manufacturing WIP, and inventory) with unstructured (e.g., news, emails, texts/dms, phone discussions, and meeting minutes), SCO tools can evolve to further integrate and automate end-to-end orchestration.

Enhanced Risk Management and Identification

AI will be able to read and interpret traditional supply chain data as well as "news" events (illnesses, conflicts, resource constraints) to predictively highlight supply chain risk and suggest courses of action.

AI Use Cases for Warehousing/Inventory

Automated Inventory Replenishment

Predict and act on future inventory requirements by analyzing sales data, market trends, and other external factors to anticipate changes in demand and generate “what-if” scenarios, helping to foresee demand variations. Automate the generation of replenishment orders, considering factors such as supplier lead times and cost, improve optimal stock levels, and adapt to market changes and potential disruptions.

Workforce Planning/ Labor Forecasting

Analyze data such as throughput and staffing levels and recommend the future workforce needs for specific times. It can utilize historical data and factors such as employees’ work experience to make predictions. By combining time series analytics, workforce data, and ML, companies can forecast future labor requirements.

Order Picking/Slotting

Analyze and streamline the process of order fulfillment, including product attributes, picking frequency, and real-time order priorities. Systems can recommend the best order-picking route, including product location and order-picking tasks. Information collected will then map out the most efficient picking routes and product placement.

AI Use Cases for Logistics/Global Trade

Optimizing Load Balancing and Distribution

Create strategies for distributing cargo optimally across a fleet, considering variables such as weight, volume, route, weather, and delivery timings. Vehicle utilization and fuel optimization are achievable by detecting efficient patterns from past data and suggesting innovative loading patterns, providing detailed plans for cargo arrangement, and adapting them in real time to changes such as vehicle malfunctions or new delivery requirements.

Automated Customs Clearance

Generate and manage customs documentation to automate and expedite the customs process. Ensure accuracy by applying international trade laws, tariff codes, and compliance rules to classify goods, calculate duties, and keep documents up to date, reducing errors and delays.

Freight Volume Forecasting

Estimate future freight needs to plan resources, optimize loads and inventory levels, and estimate freight capacity. Identify patterns and correlations that allow for the forecast of freight requirements by analyzing historical freight data, seasonal trends, market dynamics, consumer behaviors, and real-time factors such as weather or economic indicators. Simulation and continual model improvement from new data improve forecasting accuracy, adapting to changing market conditions.

Recommendations/Considerations

The Future is NOW:
Begin to explore how AI tools can help with productivity and performance across your supply chain without delay. Tools are already available to help across a broad range of supply chain activities, even if data quality and process integration require some additional effort. Although AI tools will certainly evolve, the immediate insights gained and the learnings for future implementations outweigh the work "wasted" training older tools.

Trusted content repositories:
Establish easily accessible data repositories where it is possible to host, manage, and maintain similar/common source content (synchronized with real-time systems of record with real-time connectivity and integration to key business data). This cache of long-lived, validated, unstructured content forms the basis of RAG, allowing LLMs to deliver trusted, contextual, relevant results.

Grow AI expertise:
Identify internal roles for AI innovation and transformation. Establish partnerships with technology providers and system integrators that understand your company, the supply chain, and the industry. Facilitate the sharing of goals, capabilities, and values across the product development ecosystem.

Process/productivity optimization:
Use AI to ingest unstructured data that traditional AI tools can then integrate into optimization efforts, either for full business process improvement or the movement away from paper and paper-based approaches.

AI risks and security:
Implement AI data governance standards to reduce potential biases (e.g., training data diversity) and improve data privacy. Enforce robust security measures to protect against breaches with the continuous monitoring of the model and output and ensure compliance with legal and ethical norms. Have multi-disciplinary teams perform regular audits of LLM decisions and outcomes to identify and correct biases that arise over time.

Prioritize security:
Maintain data sovereignty over IT processes and implement proactive AI drills to mitigate the risk of sophisticated cyberattacks. Improve security by renewing IT infrastructure to accommodate the growing training data needs of LLMs.

About the IDC Analyst

Simon Ellis
Group Vice President,
Manufacturing and Supply Chain, IDC

As a program vice president, Simon Ellis is responsible for providing research, analysis, and guidance on key business and IT issues for manufacturers. He currently leads the supply chain strategies practices at IDC Manufacturing Insights, an IDC industry research company that addresses the current market gap by providing fact-based research and analysis on best practices and the use of IT to assist clients in improving their capabilities in critical process areas. Within the supply chain practice, Simon is directly responsible for research in the supply chain planning strategies practice while also managing the supply chain execution strategies practice. These supply chain practices specialize in advising clients on supply chain network design, sales and operations planning, global sourcing (profitable proximity and low-cost sourcing), transportation, logistics, and more. He also supports IDC Retail Insights IT strategies practices.

More about Simon Ellis

Message from the Sponsor

SAP's strategy is to help every business run as an intelligent enterprise. When your business depends on your production, your supply chain is critical. It is the engine that drives your business. It can equally be a source of constant risk that can impair your operations.

A risk-resilient and sustainable supply chain is one that is connected, contextualized, and collaborative. SAP Digital Supply Chain solutions can help you holistically manage and mitigate business risk within your supply chain.

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Learn more

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