

► Boosting AI in Supply Chains

Guide to unlock new potential and competitive advantages

INSIGHTS

//01

AI in supply chain management enables companies to address new requirements from customers as well as to unlock efficiency gains of up to 20 percent

//02

The Use Case Library includes over 40 readily described and evaluated AI use cases across all supply chain processes

//03

To excel in piloting and scaling AI across supply chains, the project approach covers all essential success factors

01 | Introduction

The time to start with AI is now!

Volume, velocity, and variety is the most common set of terms to measure the importance of data. Likewise, it describes the scale of today's challenges for supply chain management:

▶ **Volume:**

Amazon has to track and monitor 1.5 billion items in its inventory every day¹

▶ **Velocity:**

Wal-Mart handles more than one million customer transactions every hour²

▶ **Variety:**

Blue Yonder evaluates over 200 individual variables and generates 150,000,000 probability distributions for its supply chain predictions³

These numbers create challenges, but they also provide large opportunities. By applying AI and advanced analytics to data, it becomes apparent that companies can unlock efficiency gains of up to 20 percent as well as boost sales and profitability. The impact will be transformational because it supports an organization's vision for broader supply chain automation.⁴

While for many years AI focused on research and engineering efforts, the implementation of AI across a wide range of application fields is becoming more and more prominent:

- ▶ At Zalando, a neuronal network ascertains the shortest picking routes, considering the positions of employees' and picking carts⁵
- ▶ Hitachi developed an AI system to analyze how warehouse employees deal with problems and issue instructions, increasing productivity by 8 percent⁶
- ▶ Schneider Electric's predictive supply chain model automatically optimizes routing, cutting costs by \$8 million annually and significantly reducing CO2 emissions⁷

Four things have changed in the last years that are fueling the adoption of AI: data availability, faster yet cheaper hardware, open-source frameworks, and ready-to-use AI tools specifically developed to solve business problems.⁸

Consequently, the time to start with AI is now!

When starting the journey towards an AI-supported supply chain management, companies may run across various questions, ranging from general ones like "How does AI transform supply chain management?" to specific ones like "Is my company ready for AI?" (see Figure 1).

Additionally it includes detailed descriptions of use cases and a proven concept on how to manage AI portfolios and supply chain data to realize fast and enduring efficiency gains. Lastly, the white paper shows the project approach to start the AI journey.

This is where this white paper comes in. It presents Porsche Consulting's vision for applications of artificial intelligence in supply chain management.



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Fig. 1. Questions to be answered by this whitepaper

02 | Vision

How AI will change supply chain management

Global challenges and megatrends

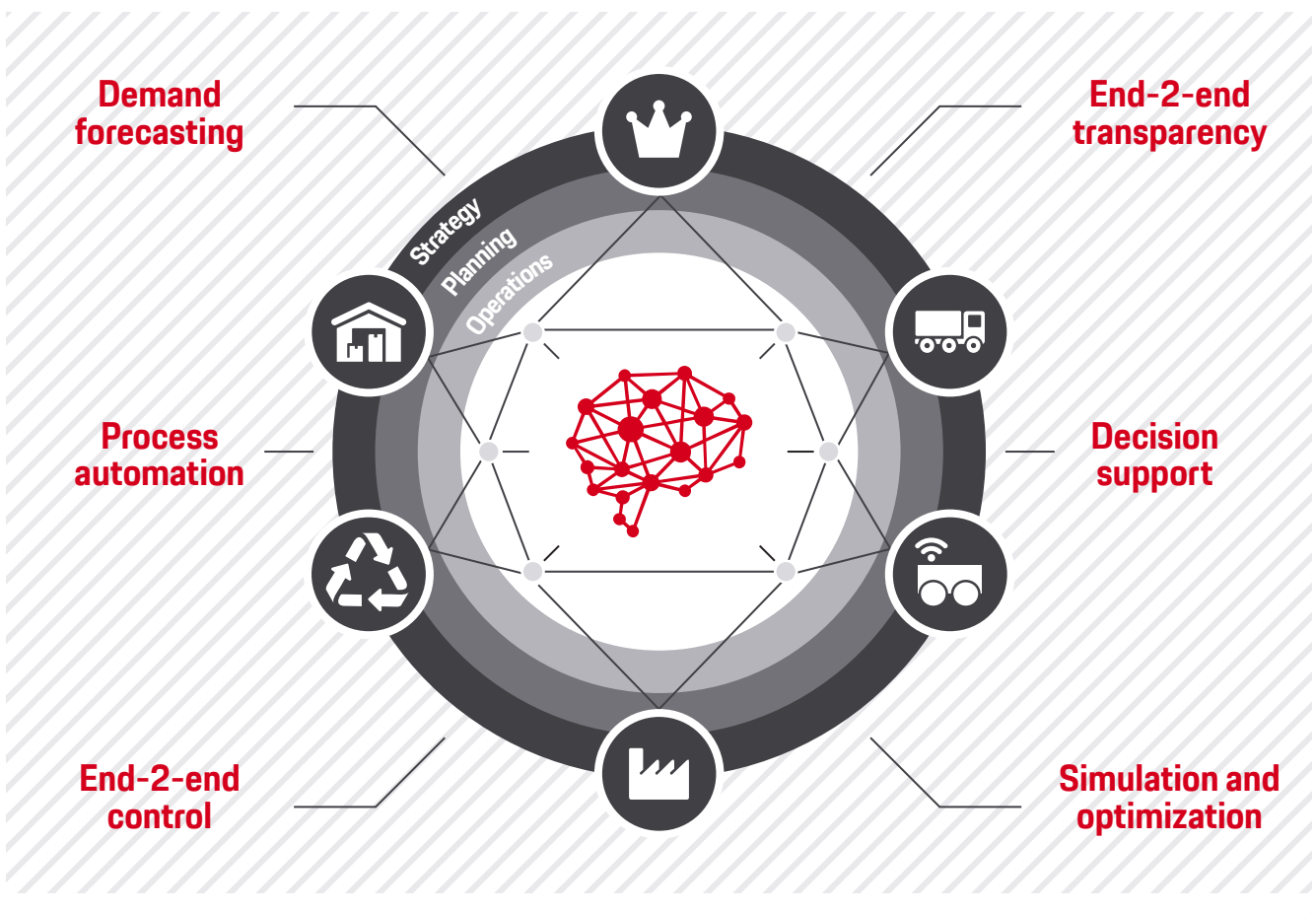
Shorter life cycles and time to market

Increasing product and parts variance

Sustainability awareness

Growing demand volatility

Global supply chain disruptions



Supply chain strategic goals

Customer experience

Speed

Efficiency

Resilience

Flexibility

Sustainability

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Fig. 2. Porsche Consulting's vision for AI in supply chain management

AI is the science and engineering of making intelligent machines.⁹ The goal is “to turn data into information, information into knowledge and insight, and knowledge into competitive advantage”.¹⁰ The use of AI in supply chain management enables companies to address new requirements from customers as well as the challenges raised by global megatrends.

For example the increasing products and parts variance makes forecasting demands and planning production much more complex. Another example is the rising sustainability awareness, which requires taking further data sources and target variables into account when performing optimizations. In addition, changes in demographics lead to reduced labor availability, requiring far higher wages and more attractive job profiles. To cope with these challenges, future supply chains will have to become more sustainable, agile, resilient, faster, and efficient.

At the heart of all supply chain processes, supply chain managers are required to make decisions. To understand where AI can support and augment supply chain processes, it is important to understand their underlying decisions. Within the vision three decision levels are distinguished: strategy, planning, and operations. These differ on the one hand by the impact of the decisions made and on the other hand by the frequency of the

respective decision-making. Consequently, both suitable AI methods and the resulting AI opportunity differ (see Figure 3). While this paper mainly focuses on AI opportunities for improving process efficiencies, it is important to mention that leveraging AI can also have a significant impact on profits.

AI-supported supply chains will put the customer at the center of attention. Advanced demand forecasting and AI-powered decision support will increase the flexibility of execution and thereby customer experience and sales.

At the same time, future supply chain management will take the entire supply chain from n-tier suppliers to aftersales into consideration as well as a cross-functional view to combine information from procurement, logistics, production planning, and quality management. E2E control will reduce excess buffer stocks, obsolete material and rush deliveries. Simulations and optimization will help design networks and processes holistically to improve resource allocation such as assets and energy consumption. Process automation will prevent the waste of valuable time engaged in repetitive tasks and help shift the labor profile to more value-adding activities. By doing so, AI supports existing business automation and lean efforts rather than replacing them.

Decision level	AI levers (excerpt)	AI opportunity *
<p>Impact of decisions</p> <p>Strategy</p>	<ul style="list-style-type: none"> • Identification of critical decision variables • Improved high value decision proposals 	<p>up to 20%</p>
<p>Planning</p>	<ul style="list-style-type: none"> • Support of highly complex planning processes • Flexible simulation and optimization tools 	<p>up to 10%</p>
<p>Frequency of decisions</p> <p>Operations</p>	<ul style="list-style-type: none"> • Augmentation of (end-to-end) process steps • Automation of information processing 	<p>up to 5%</p>

* Avg. efficiency gains on logistic cost per use case (not cumulative)/revenue increase

Fig. 3. AI levers and opportunity across decision-making levels

03 | Use Cases

Unlocking the value opportunity of AI

AI use cases with value opportunities are shown across the whole supply chain process landscape. The AI Use Case Library supports the ideation of use cases. It is based on expertise and experience from successful projects and includes ready-to-use profiles of over 40 use cases.

Each use case description starts with an analysis of the pain points within the current situation. Based on this, a solution section describes the target state and provides examples of successful implementations.

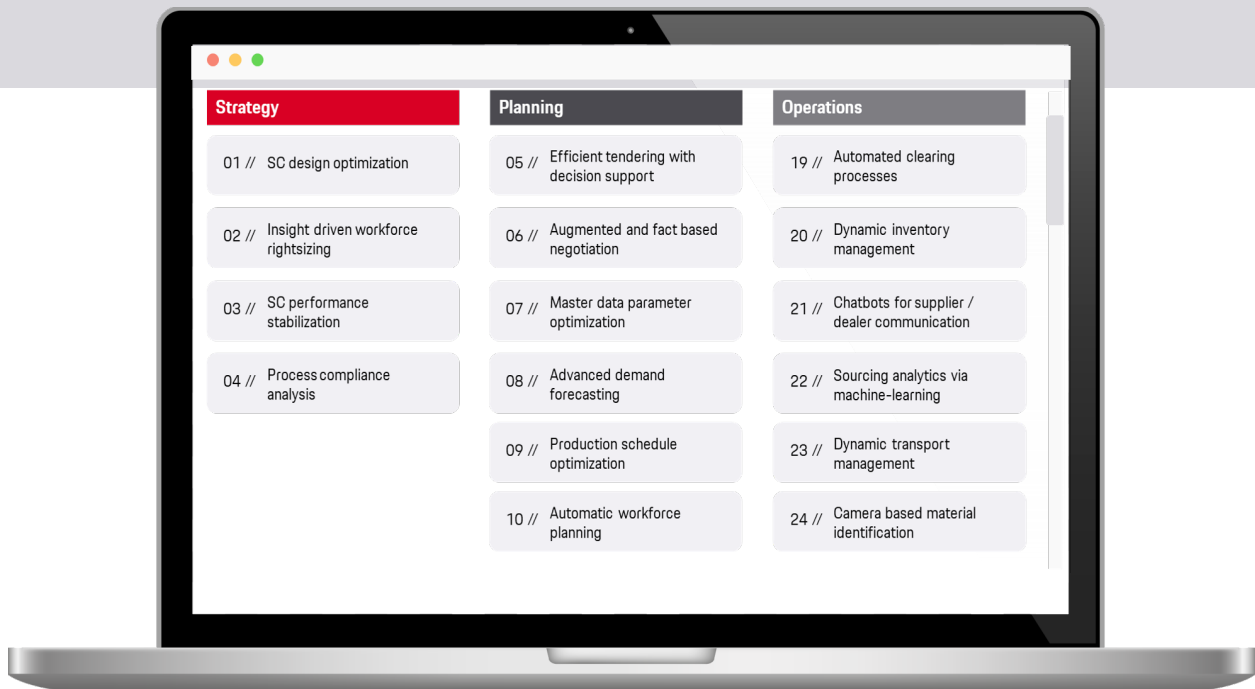
To deepen the discussion on a potential implementation concept, required technologies and AI skills (e.g. causal AI, foresight analytics, advanced optimization) are identified.

Lastly, the expected business impact and the implementation effort are estimated.

In the following, three case studies from the AI Use Case Library highlight the relevance of each section.

Use Case Library

with 40 profiles of AI applications for supply chain management



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Fig. 4. Porsche Consulting AI for SCM Use Case Library

//Strategy

Strategic decisions are made at a corporate level, where a single decision can have a very high impact with a competitive advantage. However, as implementing these decisions requires some time, the frequency of decision-making is relatively low.

Examples from supply chain management are

- ▶ Design and segmentation of an integrated end-to-end SC
- ▶ Developing an effective, customer centric supply chain governance and organization
- ▶ Developing integrated SC performance measurement and reporting mechanisms

Making strategic decisions relies on a wide range of information including long-term forecasts. Improving this information basis offers solid ground for better decisions and consequent reviews. AI can support this with exploratory data analysis and the understanding of causal relationships. A high yield example from supply chain management in this genre is defining a suitable distribution network design, which is described in the AI Case Study 01 below.

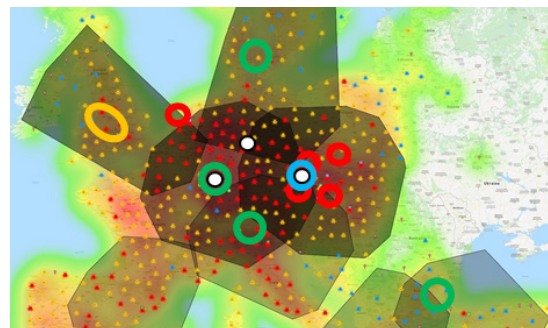
Case Study

Distribution Network Design

The client faced the challenge of developing a new distribution network strategy in order to meet future growth plans. As for many companies, his distribution network was a wide-spanning and global network. Conventional tools, such as scenario planning based on Excel, were not sufficient to mirror the complexity. Consequently, he only achieved a local cost optimum and missed out on synergies for further cost reductions.

By integrating an AI-supported simulation software into the strategy development process it was possible to design the ideal supply chain network. All relevant internal and external factors could be considered such as the location of each factory and warehouse, shifting regional demands, various transportation modes as well as local environmental and legal regulations.

Thereby, the client was able to identify cost savings of €4 million p.a. while ensuring a network configuration that supports future growth targets at the same time. The results were the foundation for a new distribution network strategy including an implementation road map and investment planning.



AI-based scenario generation based on master data, demand forecast, and transportation modes

01

//Planning

Planning processes translate strategy into actions. They range from:

- ▶ **Tendering of parts and operations**
- ▶ **Sales and operations planning, including inventory planning**
- ▶ **Planning of the physical material flow**

Although individual planning decisions may not have an impact as high as their strategic counterparts, they are done more frequently—often on a yearly or monthly basis.

Nowadays, such decisions often rely on optimization heuristics or rules of thumb gained through human experience to reduce some of the inherent complexity of the subject matter. AI can support planning with optimization tools, which can consider relevant variables and planning restrictions while providing quantified recommendations and adaptability to further planning activities.

The AI Case Study 02 shows how AI can help with the optimization of material provision to achieve better planning results as well as significantly reduce the required planning effort.

Case Study

02 Optimization of Material Provision

Due to a constantly growing number of products and variants in portfolio, the provision of more and more parts at assembly lines is required. Like in many other companies, this important task was covered through iterative manual planning, conducting workshops, and expert discussions, which are very time-consuming and do not always lead to the best solution.

By implementing an optimization approach the client was able to determine the best mode of material provision for each part. This included decisions on the space allocated to every part at the assembly line, order-picking volumes as well as load carrier usage. The algorithm uses data from many sources, including bill-of-materials and logistic costs. To support the decision-making, all results were summarized in an analysis cockpit with cost KPI monitoring and 3D visualizations.

This allows to increase planning speed of material provision processes by over 30 percent while at the same time reducing in-house logistics costs by 10 percent.



Optimized lean material provision and in-house transportation planned for every part to ensure cost-efficient material availability

//Operations

The operations level deals with managing the physical material flow, information flow, and capital flow along the supply chain on a daily basis. Although individual decisions may not have a large impact on the supply chain, the vast frequency of these decisions results in a significant value proposition for AI. Exemplary processes are:

- ▶ **Material dispositioning and clearing**
- ▶ **Operations control**
- ▶ **Energy management**
- ▶ **Customer and dealer interaction**

The repetitive manner of these decisions makes it a straightforward business case to leverage AI applications on the operations level. Such AI applications can support decision-making, be used to cover repetitive process steps, or to further automate entire processes.

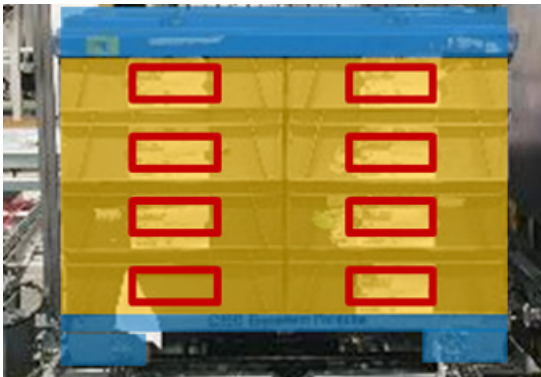
AI-supported visual inspections can help improve the efficiency of warehouse operations significantly while making the life of employees easier. This application is described in the third AI Case Study.

Case Study

AI-supported Visual Inspections

Reliable, fast, and automated material flow processes require high quality standards on load carrier and logistic data. Therefore, the visual check of incoming goods and the early clearing is crucial to avoid production downtime with much higher impact later in the process. In general, these quality checks are done by humans, which is highly time-consuming and bears the risk of missing out on small details.

Within such highly repetitive processes, AI-supported visual recognition software can carry out the visual identification and verification to ensure, e.g., the correct load carrier structure. This allows to significantly reduce the time spent on checking, correcting, and further handling wrong load carriers within (automated) warehouses and the mitigation of delays within the material flow.



AI-based recognition of load carrier quality and decision on routing and clearing

03

04 | Approach

Proven tools and methods to support your AI journey

Although the advantages of applying AI in SCM are obvious and 90 percent of SCM managers believe that AI will help them to make better decisions, 82 percent of them have already experienced frustrations with current AI systems.¹¹ These frustrations frequently can be traced back to missing or insufficient focus on business impact, missing data availability, quality and structure, or overburdened IT departments.

Therefore, Porsche Consulting developed a guideline to support businesses on their journey towards an AI-supported supply chain in four steps (see Figure 5).

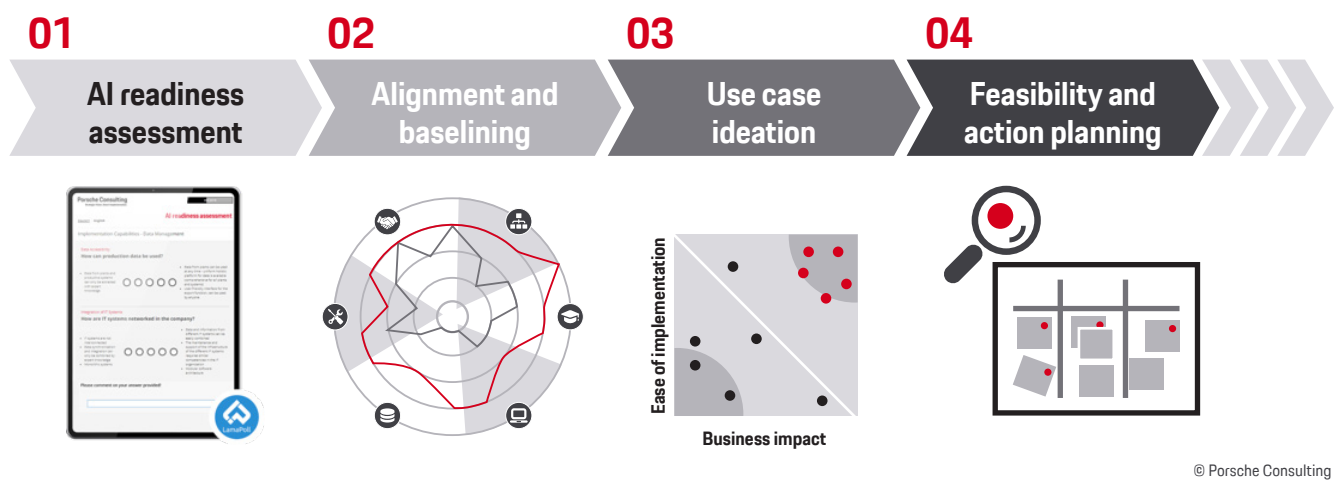


Fig. 5. Project approach to drive AI in SCM

// AI readiness assessment

Understanding the status quo of the digital maturity of the respective business is key for all upcoming actions. These insights are derived within the readiness assessment, which is conducted before the actual start of an AI project. Twenty-two questions regarding AI-relevant competencies such as governance and funding, culture and leadership, future-ready IT, data management, and digital capabilities answered by selected employees deliver a good overview on the strength and weaknesses in the corporate environment concerning AI. The AI readiness assessment lays the foundation for the subsequent on-site assessment.

// Alignment and baselining

In the next step, the results of the readiness assessment are discussed in a leadership workshop in order to achieve common understandings on the status quo and derive the way forward. A target picture for the future AI-supported supply chain is created in this phase as a result. The target picture describes the narrative and content, in which AI technologies affect the supply chain processes and integrate employees, customers, and suppliers. Another result of the workshop is the definition of goals. These are expressed by the impact of AI on the supply chain KPIs. By doing so, envisioned use cases can be evaluated by the contribution to achieve these goals. At the end of this phase, the scope of possible use cases is defined.

// Use Case Ideation

Based on the target picture and the KPIs, the ideation of use cases can start. As explained in Chapter 3, the approach incorporates a process model of the supply chain as the basis for the use case identification. Consequently, the value stream of the defined scope is depicted in terms of material, information, and capital flow as well as the digital landscape and data availability. Based on this analysis, possible use cases can be derived in brainstorming sessions. To support the creativity of the participants, there should be no further limitations to this ideation process. Afterwards, the generated ideas are rated and prioritized. Therefore a matrix with two dimensions is recommended: ease of implementation and business impact.

The ease of implementation of an AI use case depends on the complexity and maturity of the use case technology as well as the ability of the business to get the technology to work, which is determined by the existing expertise and the data availability.

The cost lever approach gives a quick evaluation of the business impact. The costs of the affected processes are thereby broken down to different cost drivers and cost types. To speed up the evaluation, cost saving effects for a wide range of use cases are pre-estimated based on experience from previous projects.

// Feasibility and action planning

So far, the prioritization of use cases aims to select the most promising AI use cases without going into too much detail. Before the use cases are tested and implemented, it is imperative to have a closer look at the selected use cases and make comprehensive business cases as well as technology and provider scouting. A very important part of this step is to draft the concept together with the domain experts. A more detailed analysis of the ease of implementation as well as quantified business impact help identify the most promising use cases for implementation.

After the implementation road map is aligned and agreed upon, the rollout starts with a pilot to proof the concept. Keeping the lean approach in mind, it is recommended to start small and scale fast. Running pilots in selected areas, evaluating the outcome, and adjusting the concept before the official rollout can save time and money while enabling the business to leverage the full potential and value propositions of AI in supply chains.

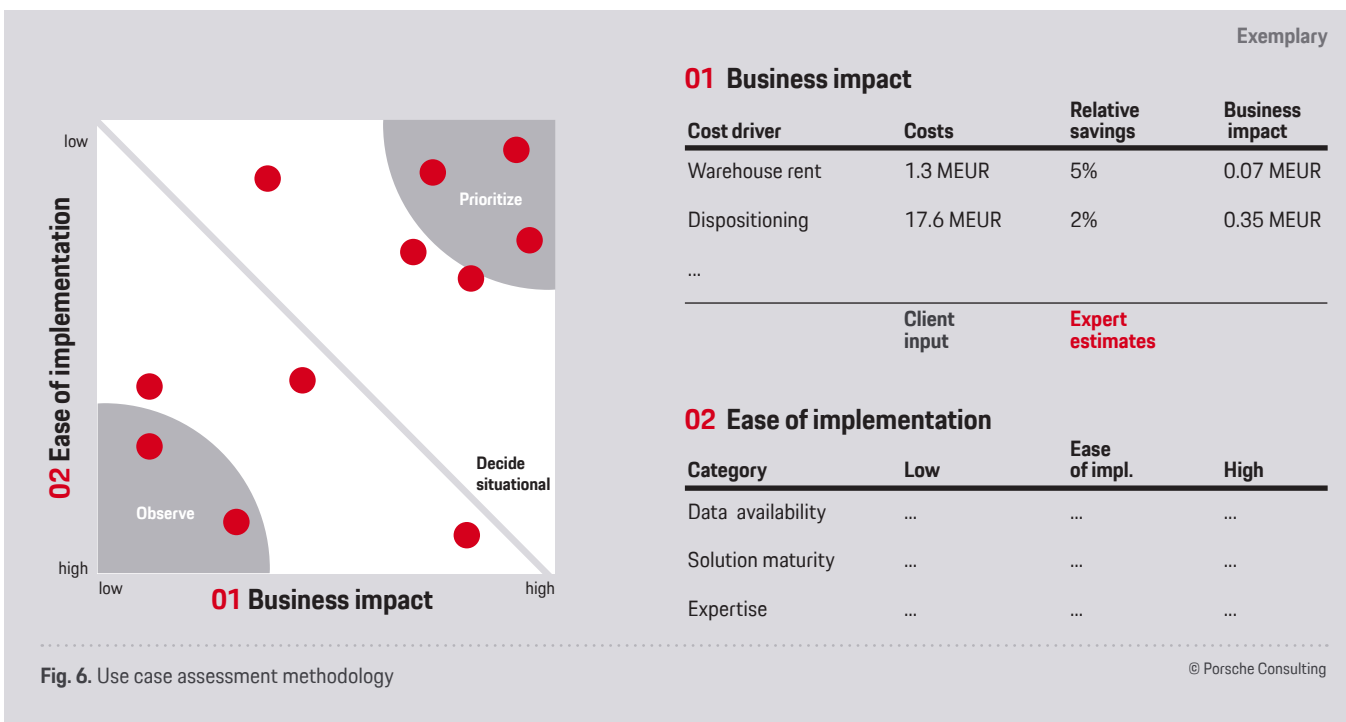


Fig. 6. Use case assessment methodology

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05 | Summary

Are you ready to leverage AI in your supply chain?

AI can support the journey towards a supply chain management that is more sustainable, agile, resilient, faster, and efficient. Value-adding use cases, to realize both process efficiencies as well as product innovations, show across the whole landscape of supply chain management and on all three decision levels: strategy, planning, and operations.

Additionally the guidelines help within the journey towards an AI-supported supply chain management based on four essential implementation steps:

- ▶ **AI readiness assessment**
- ▶ **Alignment and baselining**
- ▶ **Use case ideation**
- ▶ **Feasibility and action planning**

This can be supported by the AI Use Case Library as well as the Porsche Consulting Innovation Lab combining consulting experience with design competence, technology expertise as well as implementation strength to realize innovations.¹²

While going through the AI journey, it is important to keep four basic success factors to realize value adding use cases in mind:

- **Process vision and KPIs:** to give the AI journey a direction and to measure its success
- **People and organization:** a culture that supports innovations and people with an understanding and the skills for implementing AI sets the AI journey at work
- **Data foundation:** breaking up silos, connecting the dots, and ensuring data quality is crucial
- **Technology and tools:** the choice should consider both maturity and feasibility of the tools

Following these success factors enables the selection of use cases that deliver true value and showcase the transformative power of AI and thereby paves the way for the AI journey.

Your successful AI for SCM journey

01

Process vision and KPIs

Activities linked to clear process vision and KPI targets

02

People and organization

Open culture and capable AI organization

03

Data foundation

Supply chain data in required quality and structure

04

Technology and tools

Considering maturity and feasibility to gain fast success



Consequent focus on value-adding use cases

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Fig. 7. Success factors to excel in piloting and scaling AI

In Brief

While for many years AI was primarily focused on research, the implementation of AI for corporate purposes across a wide range of application fields is becoming more and more prominent.

AI-supported supply chains will put the customer at the center of attention, while at the same time will take the entire supply chain from n-tier suppliers to aftersales into consideration.

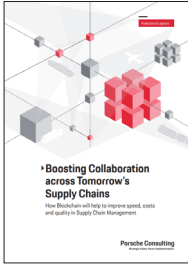
Use cases of AI for supply chain management can be distinguished using the decision levels strategy, planning, and operations, differing by their AI levers and efficiency opportunity.

The AI Use Case Library includes information on over 40 use cases, including a description of both the problem and solution as well as requirements and business impact.

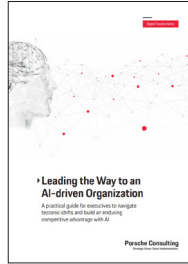
Although the advantages of applying AI in SCM are obvious, many SCM managers have experienced frustrations with current AI systems.

The Porsche Consulting project approach to excel on piloting and scaling AI covers four phases: AI readiness assessment; alignment and baselining; use case ideation; feasibility and action planning

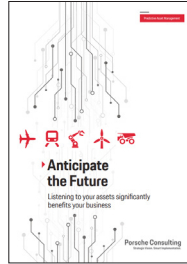
Further reading



Whitepaper
Blockchain in Supply Chain Management



Study
Way to an AI-Driven Organization



Whitepaper
Predictive Asset Management



Whitepaper
Connected Procurement

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Appendix

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