

ARTIFICIAL INTELLIGENCE IN LOGISTICS



Artificial Intelligence –
more than just a fancy buzzword

The potential of digitalization and artificial intelligence (AI) in logistics is enormous: By 2025 alone, digitalization in logistics – as a prerequisite of AI utilization – can unlock \$1.5 trillion of value for logistics players. This point of view describes opportunities of AI in the logistics industry and contains an overview of value levers of AI based applications in logistics. It encourages logistics players to turn into the fast lane by early adopting and benefitting from AI: staying ahead of the competition by reacting quickly, using knowledge gained from data, optimizing processes and designing new business models.

According to Tractica, AI will generate revenues just short of \$90 billion by the year of 2025. Companies around the world are starting to integrate and incorporate AI applications as the speed of deployment increases. From 2021 to 2025, the revenues for AI applications are projected to more than triple.¹ According to an analysis of the World Economic Forum, digitalization in the logistics industry – as a prerequisite of AI utilization – can unlock \$1.5 trillion of value for logistics players by 2025 alone, not yet considering the \$2.4 trillion worth of societal benefits.² Undeniably, the potential of digitalization and AI in logistics is simply enormous.

AI in simple words

AI detects patterns from already existing logistical data sets and generates new insights from those patterns. It is the execution of tasks within a computer, which usually requires human intelligence. In simple words, it is the ability of machines to make intelligent decisions like humans do and learn from decisions made in the past.

2021: the rise of AI utilization

After little change in the use of intelligent technologies or AI in the previous two years - according to the [IT Trends Study 2022](#) utilization has risen significantly during the last 12 months and many companies have made the leap from implementing pilot projects to using artificial intelligence in their daily business.³

The most important motivation for the use of intelligent technologies continues to be the automation of manual work. Favored by the ongoing digitalization and the new opportunities it creates, almost 46 percent of users now use AI for this purpose.

At the other end of the scale is the optimization of supply chains, which has so far been tackled comparatively rarely, namely by only just over one in seven participants. But the respondents seem to recognize the potential in this area, since, in two years' time, the number of users will double. However, the path to supply chain optimization with AI is complex, because before implementation, the supply chain participants must agree on data formats and use of data.

AI as a gamechanger in logistics

The logistics sector is generating and processing a continuously rising amount of data. It's truly becoming a data-driven domain. Therefore, AI is seen as a gamechanger for logistics. According to a study from InData Labs, artificial intelligence is – besides blockchain technology – one of the most disruptive technologies in logistics.⁴ Goldman Sachs estimates that the use of AI-powered robotics, automation, process optimization, and data analytics can reduce the costs of the logistics sector by 5%. In a margin-driven industry, these savings can lead to efficiency, advancement in digitalization and resilience in supply chains.⁵

1 <https://de.statista.com/infografik/14245/prognostizierter-umsatz-mit-ki-anwendungen-weltweit/>

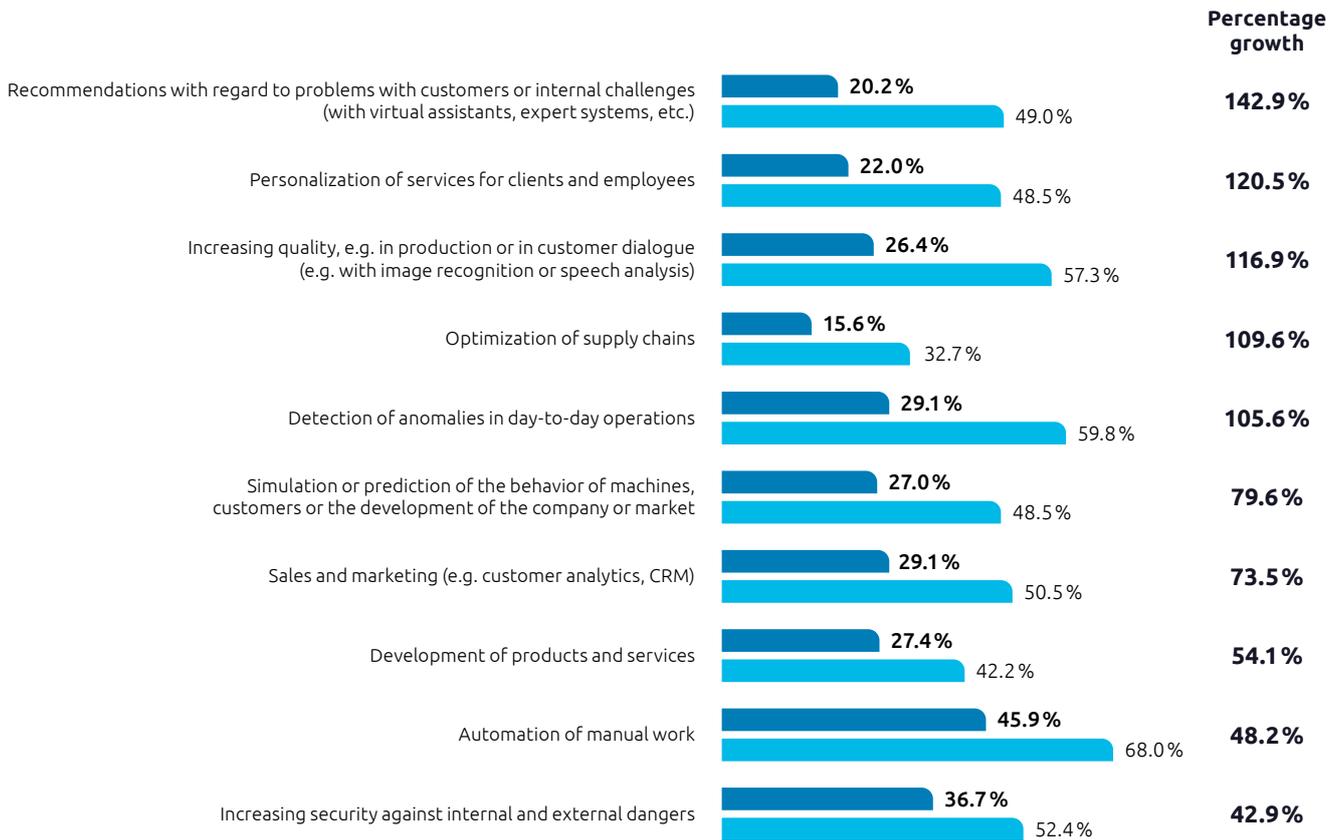
2 <https://reports.weforum.org/digital-transformation/delivering-change-digital-transformation-in-logistics/>

3 <https://www.cappgemini.com/de-de/resources/studie-it-trends-2022/>, page 20

4 <https://indatalabs.com/blog/ai-in-logistics-and-transportation>

5 <https://www.dhl.com/global-en/home/insights-and-innovation/insights/artificial-intelligence.html>

Which processes do you support with intelligent technologies today and in two years' time?



Basis: Users of AI technologies today (n = 113) and in two years' time (n = 107), top box values 1 and 2 on a scale from 1 (very intensive) to 5 (not at all)

■ Today
■ In two years' time



Nothing is more expensive than a missed opportunity."

H. JACKSON BROWN, JR.

We, at Capgemini, identify clear business opportunities and partner with organisations to transform and manage their business by harnessing the power of technology. Several years of consulting experience from multiple projects enabled the development of an overview showing the different areas of applications of AI in logistics in a single presentation. We strongly believe that with this overarching, process-oriented presentation – which does not claim to be exhaustive – logistics companies can embrace more opportunities of AI in the future.

VALUE LEVERS OF AI BASED APPLICATIONS IN LOGISTICS



Supplier



Ship



Plane



Port



Airport



Rail

Prognosis

Demand & Availability Forecasting

Predicting market demand as well as availability of materials to balance procurement

Identification of Fraud Patterns & Management

Preventing & detecting fraud in real-time, e.g. due to tracking weight changes of containers

Crew Planning

Enabling prognosis of resources needed in volatile environments

Predictive Maintenance

Monitoring/predicting failure of port/airport assets (AGVs, container bridges), monitoring location/condition (switches, components of train)

Load Utilization Improvement

Predicting rail transport utilized capacity based on demand information

Automization

Autonomous Purchase

Automating sourcing based on stock market prices including forecast

Autonomous Navigation

Automating the consideration of ecological and economical factors such as climate or customs regulations

Autonomous Pick & Pack

Automating seeking, bundling and packaging of items by autonomous robots

Optimization

Product Quality Control

Using optical sensors, etc. to identify completeness, damage & errors

Shipment Analytics

Optimizing e.g. pricing models, demand, quality and partnering models

Optimization Disposition & Allocation

Improving route efficiency and localization of goods

Routing Optimization

Optimizing route planning and scheduling based on real-time monitoring

Demand Insights & Pattern

Analyzing patterns, market behavior & trends for better understanding

Fleet Diagnostics & Transparency

Analyzing fleets and mode of transportation based on geographical location, real-time status and driving information

● Dispatch/Incoming Parties ● Transportation ● Reloading Point

This model presents excerpts and does not claim to be an exhaustive overview

The model compilation “Value levers of AI based applications in logistics” describes significant use cases for different stages in the logistics value chain. Elements involved in these stages (see top row) are transportation (blue), reloading point (light blue) and dispatch/incoming parties, i.e. suppliers as well as manufacturers/producers, retailers/stores and end-customers (deep purple). Vertically, three layers describe the key categories of AI use cases in logistics (prognosis, automatization, optimization). Some cases deliver even more value if data is exchanged along the value chain, for example, by informing partners automatically about the expected arrival of goods, transport conditions or upcoming maintenance of machinery.



**Manufacturing/
Producer**



Road



Warehouse



Last Mile



Retailer/Store



End-Customer

**Forecasting
Just-in-Time
Demand**

Predicting parts required

**Capacity
Prediction**

Predicting transport capacity required based on demand information

Staff Planning

Predicting need of resources in volatile environments

**Digitizing Stock
Management**

Localizing material in real-time by image recognition for inventory audit, checking article availability, picking and loading capacity

Demand Sensing

Predicting retailers' orders

**Realtime PIM
Monitoring**

Processing and predicting product information, e.g. availability of promotion data

Use case on page 8

**Leadtime
Prediction**

Shortening the leadtime to the customer and providing higher quality of information

**Stock & Tool
Operational
Planning**

Assessing availability of facilities and manufacturing tools to reduce damage & loss and increasing process efficiency

**Autonomous
Driving**

Considering environmental factors, e.g. weather or traffic

Track & Estimate

Automating estimation of delivery based on traffic data on capacity utilization

**Anomalies
Order Detection
Monitoring**

Automating identification of deviations based on different sources

**Automatic
Clarification
& Declaration**

Automating document processing, data extraction and validation

Quality Control

Identifying completeness, damage and errors with optical sensors

**Increase of
Traffic Safety**

Detecting drivers' tiredness and collision risks

**Warehouse
Rationalization**

Enabling prediction of space needed in volatile environments

**Scenario
Driven Transport
Planning**

Optimizing routing visualization & efficiency taking conditions of parcels, vans & inventory and traffic into account as well as availability of qualified staff

**Customer Service
Improvement**

Using chat bots, call transcription, intelligent routing, sentiment analysis, VoC analytics, text-to-speech, multilingual omnichannel communication, etc.

Order Fulfillment

Optimizing the fulfilling of orders by re-routing (e.g. of raw material provided by supplier)

Car Platooning

Using of wind chats for efficient transport

**Warehouse
Storage
Optimization**

Improving article storage locations to support shorter pick ups (relocate goods)

**Customer Insights
and Purchase Predictions**

Understanding customer behavior and taking dynamic environmental influences into account (such as weather) to execute loyalty programs and enable dynamic pricing

THE POTENTIAL OF AI IN LOGISTICS – USE CASES



AI based anomaly detection helps secure frictionless order flow

An international retailer implemented an anomaly detection solution based on artificial intelligence. It supports the customer fulfillment process and monitors the flow of incoming customer orders as well as the flow of stock data from stores to the central warehouse information service. Issues in both had previously led to instabilities with a negative impact on the customer experience, turnover and business. One incident, for example, caused the delay of more than 20,000 orders, representing one quarter of total orders on that day. Now, the solution detects anomalies early and alerts specialist teams to investigate and solve issues, if necessary.

Shipment analytics improved forecast performance by more than a half

AI already has significant implications in the aviation industry. An aviation group with operations worldwide implemented a use case to improve shipment volume planning with AI. Logistics companies, especially in the aviation industry, face strong fluctuations in shipment volumes, therefore free capacities in the central warehouse are difficult to calculate and plan. Dispatching all critical inventory on time is a huge challenge for transport and logistics companies during peak times. The AI solution, especially developed to solve the problem, improved the forecast performance for the number of incoming parts by more than a half. This enabled optimized crew planning and quick reaction to requests.

AI powered customer service improvement

One of the world's leading logistics companies made an important step towards improving their customer experience with an AI based voice assistant. By collaborating with Amazon, the company's customers can now easily retrieve information about their parcel status by asking Amazon's Alexa about the arrival time. Besides answering these questions, Alexa can also ask for further relevant information and needs with the use of conversational capabilities to take further actions. In case customers face issues with their shipments, they can be routed to the customer assistance of the logistics company. This ensures improvement in customer service in an intelligent way and manage customer relationships proactively. Furthermore, an Israeli startup developed a chatbot that helps cut down close to three quarters of operational logistics costs by route optimization and successful first-time delivery. The chatbot contacts the recipient via SMS or Facebook messenger and coordinates special instructions regarding delivery time and location.



Scenario-driven transport planning with AI

Tank trailers usually pass different stations. They load containers, transport the goods to the customers sites and unload. Afterwards, they go through a washing plant, if for instance heavy metals have been shipped. All those factors need to be included in routing optimization, which makes planning of crew and fleet complicated. An AI application improves the forecast of delivery times taking volume, utilization of stations and personnel availability into account. This ensures that the customer receives more precise information about when his goods are being shipped or whether an order can be processed at short notice. This precise information increases customer satisfaction and improves relationships significantly.

CAPGEMINI SUPPORTED BSH HAUSGERÄTE

with an AI-based real-time Product Information Management (PIM) monitoring system



In a nutshell

Client challenges & business need:

BSH wanted to provide product managers with greater visibility into the timelines for updates to the website and ensure that the addition of new information occurred with greater predictability.

Solution at a glance:

Using AI technology and working with Capgemini, BSH developed a visual dashboard to display update queues and predict processing times.

Results & benefits:

- Accelerated time-to-market through reduction in update bottlenecks
- Faster reaction to changes in product availability
- Less support required from IT, allowing the team to focus on more valuable tasks

Challenges: excessive update requests lead to delays

In a fast-paced consumer goods market, businesses need to be able to update their online portals incredibly quickly to stay competitive and satisfy customers.

While BSH had effective systems in place to update its digital channels, mass data updates still offered a substantial challenge. When queue sizes regularly increased to more than 10,000 items in each queue, it resulted in multiple days of waiting time before updates were realized. Also, the lack of insight into the system and the update process made the overall processing time hard to predict. In order to address this challenge, BSH decided to partner with Capgemini to develop a solution that would enable more effective management of its digital update queue while providing managers with more information throughout the process.

Solution: a new system for clearer insight into updates

To address these challenges, Capgemini proposed developing a new system that could visualize and predict queue processing times. BSH and Capgemini developed an artificial intelligence based prediction and visualization system organized into three layers: a bottom layer for data storage and retrieval, a middle layer for processing and analyzing the data using several different machine learning algorithms, and a top layer for data visualization.

Results: visibility improves planning

The new system has resulted in significantly improved efficiency. As opposed to the lack of clarity at the beginning of the partnership, BSH product managers can now visualize the timelines of their product information updates without constant and manual communication with the IT team. This led to more efficient decision-making.

AI in logistics - things to consider

Besides the benefits, the implementation of AI applications also faces challenges. Employees were critical about AI applications and were reluctant to let the application take the decision. Departments usually trust software with 95% accuracy or more.⁶ However, since the accuracy of the AI application rises over time with the increasing amount of learning data available, it is important to communicate progress and use employees' feedback to improve the application. Change management is key for introducing AI applications, and small incremental steps help to make the implementation process of an AI application more transparent and generate quick wins, creating motivation for the journey ahead.

Adapt today for a smarter tomorrow

Today, we live in a connected world. Volatility and the pace of change characterize the decision-making process. Disruptive factors like the most recent Covid pandemic and the Suez Canal congestion caused by the container ship "Ever Given" in March 2021 illustrate the importance of the ability to rapidly adapt to a shift of demand and supply. Though modern technologies help to track and trace in real-time, it may take time for skilled staff to draw conclusions from all the data.

This is where companies benefit from AI: It enables quick reactions based on knowledge gained from data as well as the optimization of processes and design of new business models to stay ahead of the competition.

The competition, in turn, will also start leveraging AI, so companies introducing AI too late will face difficulties to catch up later, because it will take time to develop use cases, implement the technology and train the staff.

AI applications have advanced over the past few years and the IT industry is continuously working on simplifying its deployment and creating ready-to-use services. Since supply chains still have a lot of room for improvement, fast adopters are on the winning track.

⁶ Level3 GmbH, Next-Level Operations Management: Automatisierte Entscheidungsunterstützung mit Hilfe von Daten und KI, 4 May 2020, Webinar/Video, www.bvl-digital.de

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