

TREND REPORT 2023

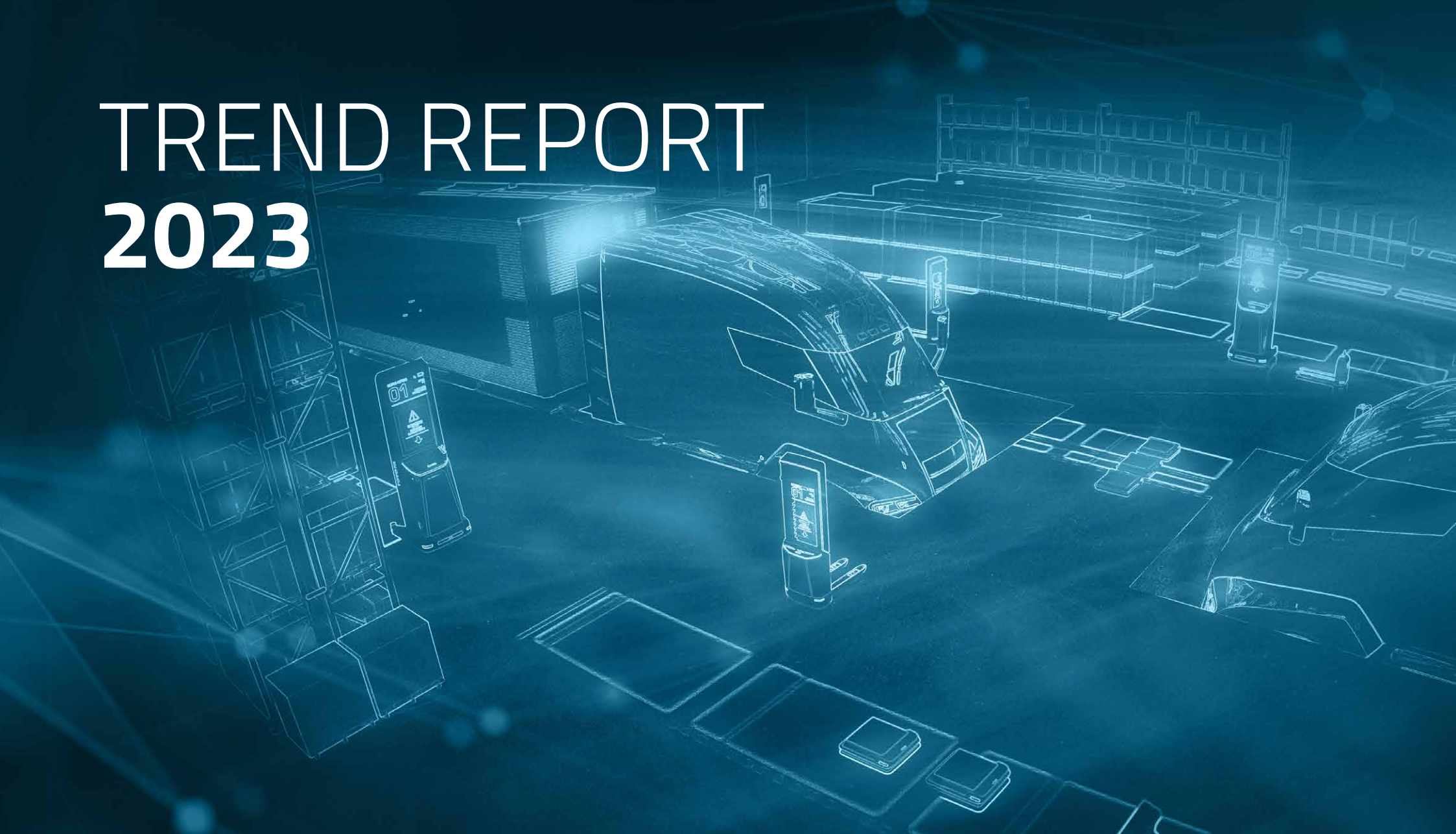


Table of contents

- 4 | Trend Radar & Trend Report: Introduction
- 6 | Trend Report 2023: Executive Summary
- 8 | Impact from Business Landscape
- 10 | People and Social Influences
- 12 | Logistics: Supply Chain Developments
- 14 | Sustainability in Logistics
- 16 | Technology: Artificial Intelligence
- 18 | Technology: Automation
- 20 | Technology: IoT and Connected Logistics
- 22 | Final note





Trend Radar & Trend Report: Introduction

The world of logistics is going through a considerable transformation. There are significant ongoing changes in the business landscape, a mindshift in the general population altering social behaviour, new technologies, and radical developments in logistics – all presenting both threats and opportunities to players in the logistics sector.

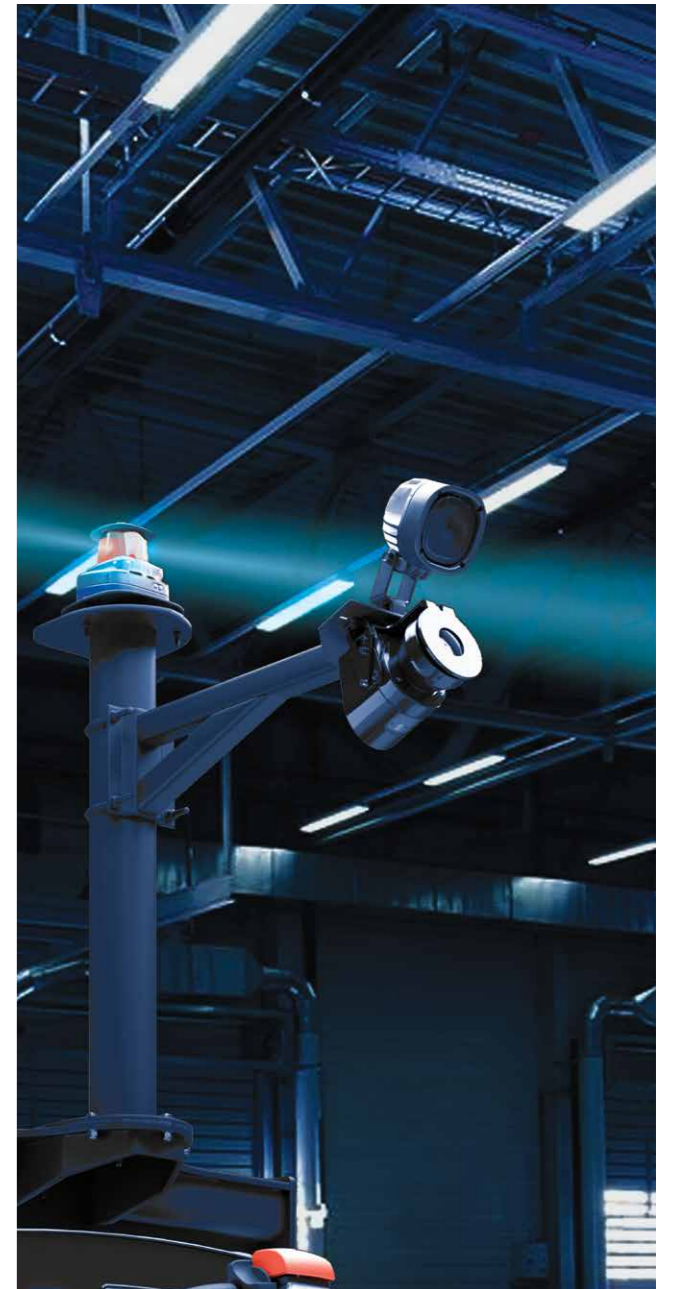
To monitor, understand and track these developments, Toyota Material Handling Europe has developed a 'Trend Radar' and this corresponding Trend Report. We have achieved this through continuous consultation with many and varied sources to identify and understand current trends that could affect the world of logistics.

Our overall objectives are to be fully updated and prepared when investing in future opportunities and technologies, to anticipate and counteract threats and, most importantly, to support our customers by keeping them well-advised - so they can make informed decisions for the future.

We use numerous sources: open sources, Universities and Institutes, including the Fraunhofer Institute for Material Flow and Logistics IML, reports and studies as well as in-depth discussions with our customers who are key drivers in the logistics industry. However, although we are using multiple high-quality sources, predictions about the future will always involve a degree of speculation and uncertainty, given the fast development and the complexity of the industry we are operating in.

In the Trend Radar we have mapped all significant developments, looking at them from various perspectives. Technology trends are displayed on the right side, and logistics and business trends on the left side. Our view on potential impact is depicted by the arrangement and positioning of the trends with anticipated timeframe. Trends closer to the centre have the shortest timeframe.

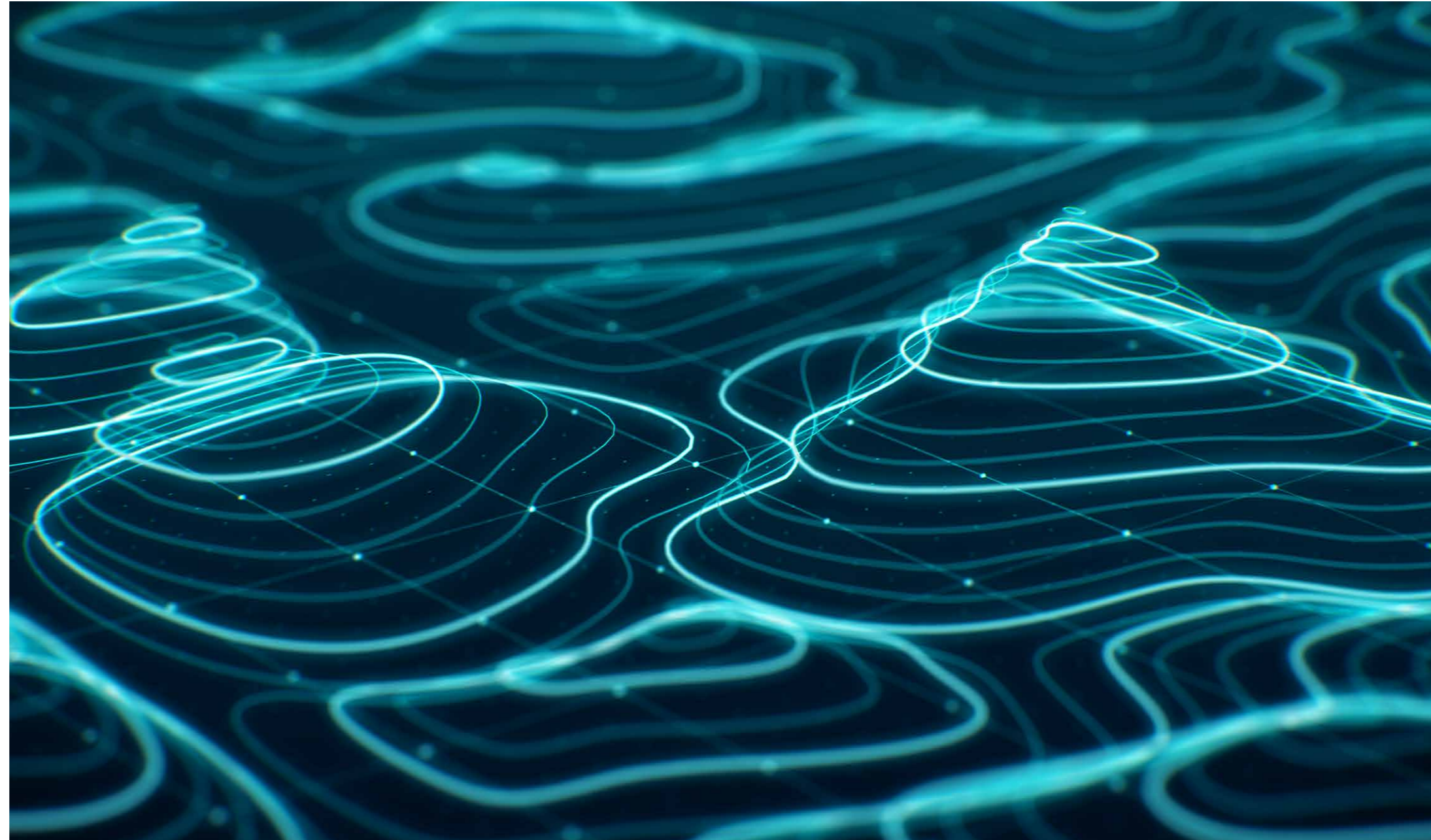
This Trend Report for 2023 gives a high-level overview of the key trends that we believe are currently most urgent and relevant to understand when planning for the coming years. In addition, we will be publishing a number of 'Insight' documents that dive deeper into key subjects.



Impact from Business Landscape

Europe has recently experienced a turbulent period, resulting in some uncertainties in the logistics industry. The pandemic and the war in Ukraine have dramatically changed conditions for logistics due to economic instability, component shortages and challenges to logistics processes, which in many cases have proved not to be as resilient as expected. Whilst it is difficult to accurately make forecasts for the period ahead, we can still see some general trends that will most probably affect the landscape for logistics providers in the coming years:

- According to the European Central Bank (ECB) the overall financial activity in Europe is entering a slower phase and overall GDP (Gross Domestic Product) is expected to stay at a comparatively low level in the short term. Therefore, higher inflation will gradually drop down again to a more normal level. This downturn is likely to affect consumer behaviour which could result in less shipments, with a consequent slowdown in supply chain demand. However, the significant backlog of existing orders may soften the downturn in some sectors, and maybe also lessen the impact on unemployment rates.



- Sustainability in logistics is a key priority today, further fuelled by legislation and recent high energy prices. The EU has launched its Green Deal, driving a faster transition, and both companies and consumers are increasingly becoming aware of their ability to contribute. This shift in awareness and decision-making is in many cases accelerating developments even more than legislation. Electrification, investments in green energy and everyday choices towards sustainable offers are examples of the transition happening, having a major impact on the logistics industry.
- Technology continues to develop at a very fast pace, and this will affect society and our industry in many different areas. A major factor is the progress in artificial intelligence, a branch of computer science emerging at tremendous speed, offering the possibility of entirely new never-before-seen solutions. Accelerated by labour shortages, the technology is also a powerful engine behind the automation of processes, vehicles and in other areas that can be made less dependent on human interaction.
- New geopolitical tensions and trade conflicts, partly but not only in the wake of the war in Ukraine, might have an impact on the outlook of the global economy, causing disturbances in global trade - and could possibly disrupt or change global supply chains. By their nature, these developments are very difficult to forecast.

People and social influences

According to the EU, current unemployment rates in Europe are at their lowest in decades. The European economy is expected to slow down in the short term, but the overall consensus is that the labour market will prove to be resilient and the level of unemployment will remain relatively low. Looking ahead to 2050, the active working population is expected to be approx. 100 million people fewer due to an ageing population, putting European financial systems under even more pressure.

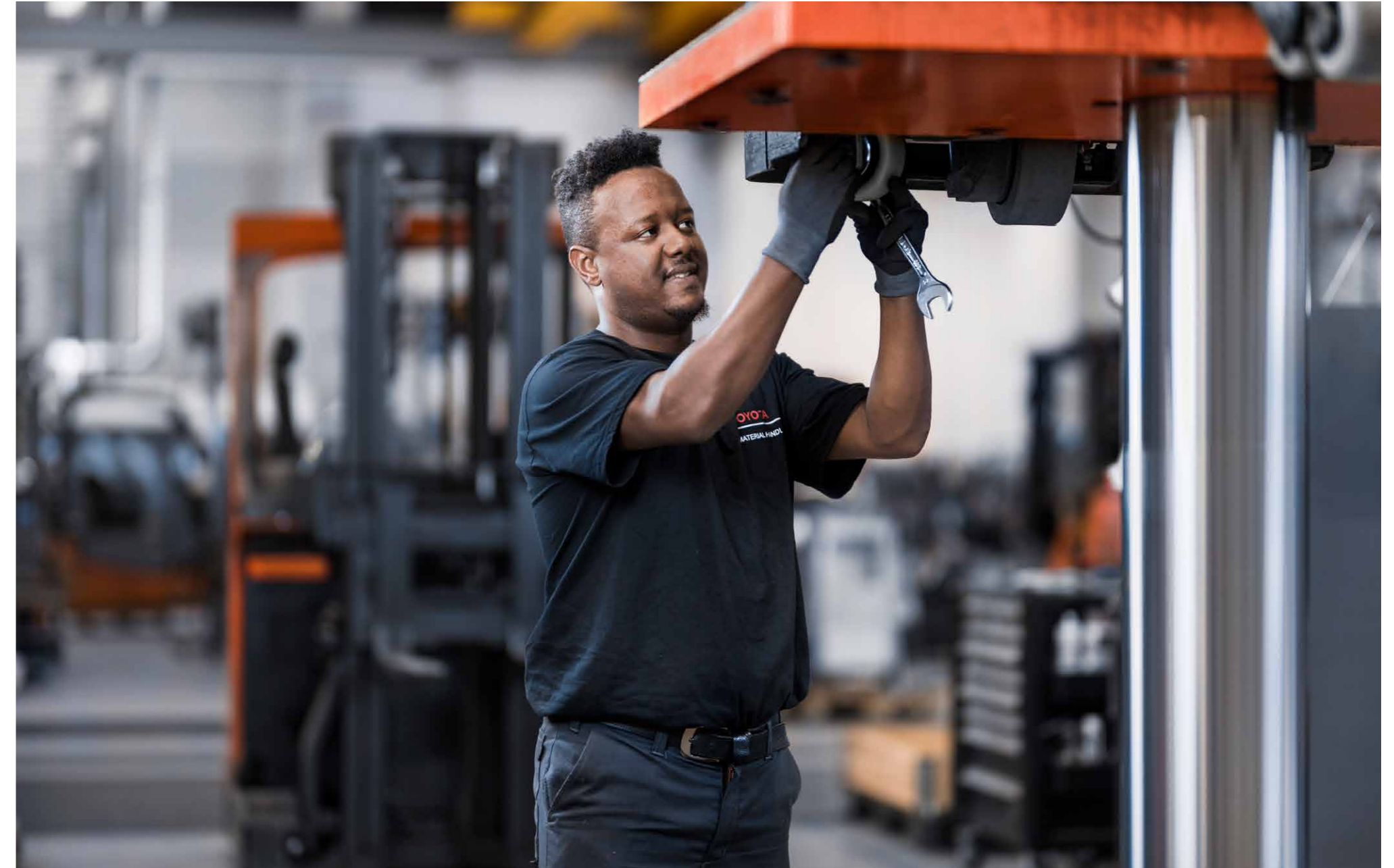
In parallel, a transition in the labour market is occurring resulting in faster technical developments in areas such as automation, data analytics and digitalisation in general. This calls for significant numbers of highly skilled people, while other sectors are slowing down and being phased out. A skills mismatch is occurring between available and required competence. A challenge for the logistics industry will be to adapt to this new situation by abandoning some competences whilst embracing others, as well as training people to develop new skill sets. It is likely that the shift in skills will be particularly challenging when seeking to recruit for high-tech roles.

For the logistics sector, we can expect to see several trends and challenges in the coming years;

- Customer behaviour will continuously drive change in the sector. Younger people with a higher digital readiness are driving the expansion of e-commerce and raising the level of expectations in terms of speed, cost minimisation, flexible return policies as well as a high quality digital experience. The “green transition” and the move towards a more sustainable society will continue to fuel the interest for used and second-hand offers and this will additionally present supply chains with new challenges. Companies with traditional distribution set-ups will need to continue to invest heavily if they want to stay relevant while confronting the change in consumer behaviour.

- The shortage of labour and high personnel turnover in certain areas of logistics such as lorry drivers and warehouse staff will increasingly become a “win-or-die” fight for many companies. This is likely to drive significant investments in solutions that make logistics more resilient and less people-dependent, with solutions like automated material handling and remote-controlled solutions. In processes where it is not possible to automate, workplace conditions such as ergonomics are likely to be a decisive factor in attracting skilled workers.

- The overall ‘war for talent’ in society will also be a major challenge for the logistics industry. Competing with other industries undergoing similar transitions, this will drive the need to develop new ways of working. In some circumstances, benefit packages will be increasingly important to potential employees, together with new ways of working, e.g. flexible working hours, remote work, and career paths offering sufficient development opportunities and training packages.





Logistics: Supply chain developments

The supply chain, and logistics in general, are currently undergoing numerous extensive transformations driven by the change in consumer behaviour, legislation, and opportunities created by rapid technology developments. It is impossible to list all existing trends identified in this field, but we can highlight a few:

- In Europe e-commerce is expected to continue growing at a 10% rate, affecting almost all sectors. This puts further strain on speed and handling the returns generated, which in some cases amount to almost 50%. We see a major shift in terms of equipment as order units are moving from pallet loads to smaller volumes, very often single units, demanding different types of handling. Order picking, being the most labour-intensive process in warehousing, will be a priority for optimisation. The other key focus area will be reducing the number of returns by improving digital solutions that improve product fit rates.
- With the rise of e-commerce and the battle to win customers, the need for cost-efficient last mile delivery options has exploded during recent years. Retailers and logistics operators have found new ways of fulfilling customers' increased demand for convenient delivery options such as click-and-collect lockers and in-store pickup options. Going forward, we see more alternatives being tried and tested, like delivery drones, but also trends in highly automated micro fulfilment centres (MFC) located in densely populated areas.
- Omni-channel logistics describes the need of running two delivery processes in parallel, both needed to meet the highest quality and speed in order to be competitive with the best in the respective class. It will always be a significant challenge and require constant investment for a traditional retail company to grow an e-commerce business (and the associated logistics) if they want to compete with the e-commerce giants such as Amazon.
- During the recent global pandemic, it became obvious that today's supply chain is not as resilient to disruptions as anticipated and major disturbances such as component and container shortages have caused interruptions to normal flows all over the world. Major investments will have to be made in the coming years to develop new structures that can withstand similar disruptions, but also face the challenge and difficulties of recruiting and retaining people. New supplier strategies and automated solutions are examples of important actions that can provide solutions.

Sustainability in Logistics

From an environmental perspective the logistics sector will face some real challenges going forward as the EU Green deal sets up targets to reduce greenhouse gas emissions (GHG) in the transport sector with 90% by 2050. Several initiatives to reduce CO2 emissions have been launched on European and national levels to drive the transition from fossil fuel-powered transport to greener alternatives. This trend is also fuelled by new consumer pressure. The Sustainable Development Goals (SDGs) of the United Nations also include economic and social sustainability, in addition to environmental sustainability. Sustainability is not limited to ecological criteria alone.

- The electrification of road transport is accelerating. With large truck manufacturers committed to increasing their electric offer in the coming years, the journey towards electrified logistics is expected to gain speed. This will put further strain on logistics operators who will have to invest in new fleets, on-site charging infrastructure and re-skilling of workforces. This journey will however not be trouble-free. Sufficient access to clean energy to charge the growing number of electric vehicles will demand an upgrade of the energy supply infrastructure, one that typically moves at a slow pace. Due to the challenges to source enough clean energy, other solutions will also see their share increase. Most important is the development of hydrogen and fuel cells which will be available for all applications but will predominantly come through for larger vehicles like heavy lorries and boats.
- Sustainable logistics comprises far more than emissions and CO2. There will also be great emphasis on reducing waste in operations through preventing and reducing damage of goods, recycling and re-using resources, and focussing on safe operations in order to prevent accidents - therefore lowering the risk of inflicting damage on people and equipment. Safe vehicles and solutions to avoid damage or abuse will become the norm, driven by different technological developments that enable fast and cost-effective solutions.
- It is clear that companies need to answer to a rising demand for sustainability reporting and a different set of KPI's to meet legislative and customer requirements, so they can prove how sustainable their operations really are. In addition, EU's forthcoming Corporate Sustainability Due Diligence Directive (CSDD) will require companies to comply with human rights throughout their supply chains. This relates specifically to social sustainability.
- Goods return processes is another area that poses real challenges today, especially within e-commerce, when it comes to creating excessive transport and sometimes extra waste due to the disposal of goods. Players within the industry need to develop new ways of working to tackle these challenges.





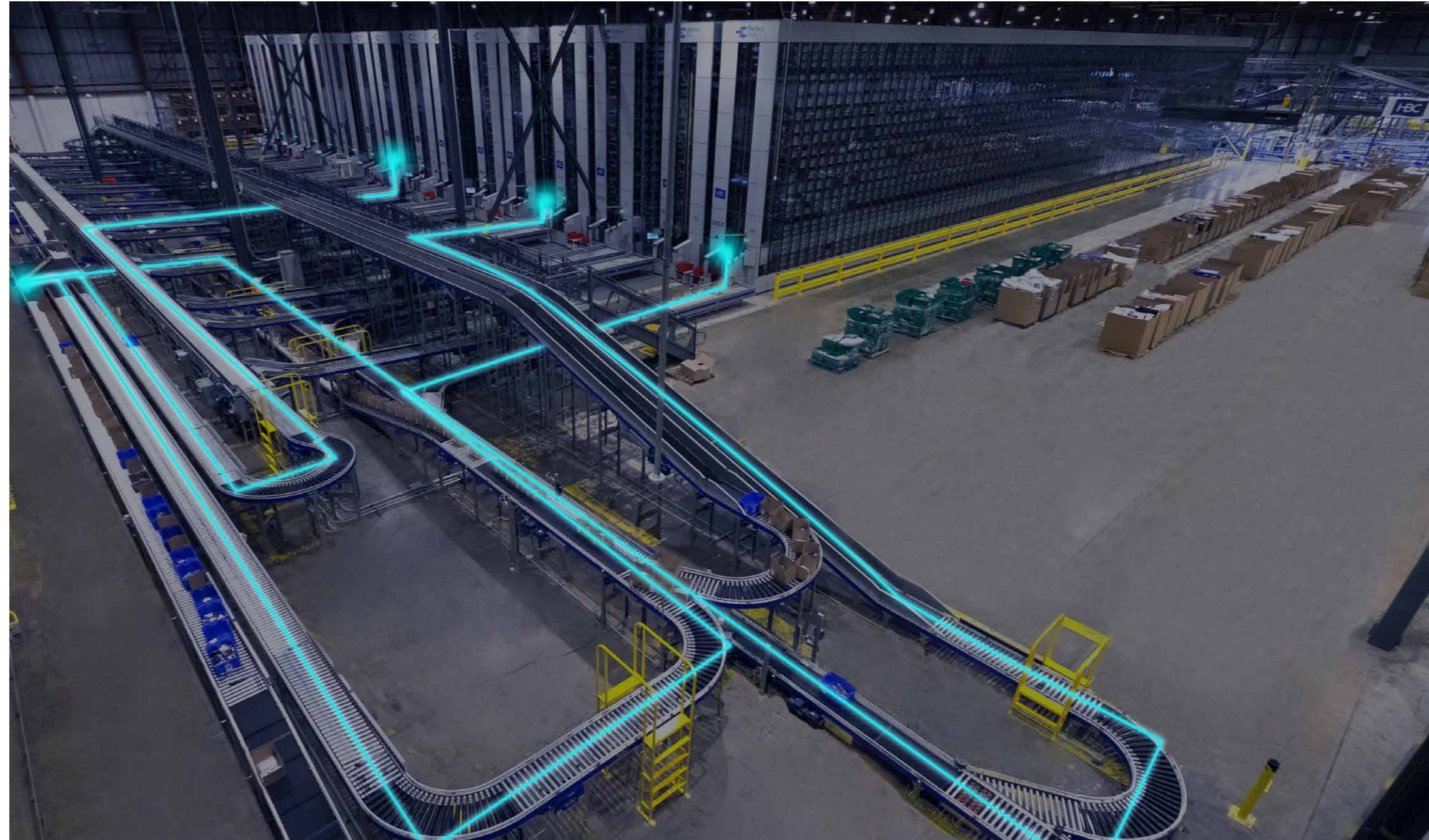
Technology: Artificial Intelligence

Artificial intelligence (AI) and Machine Learning (ML) are already being used in logistics to improve efficiency, reduce costs and to enhance customer experience. This is clearly a trend that will continue to accelerate when more and more companies gain a better understanding of the power of data, AI and ML. Here are a few practical examples of areas where we expect to see AI-driven applications develop:

- AI and ML are being used to develop self-driving trucks and other types of autonomous vehicles or equipment for replenishing, sorting, picking and transporting goods. AI can also be used to determine the most efficient routes and order sequence in order picking, considering factors such as location of the goods, drop off points and distance. This can improve both manual and automated traffic in a warehouse by cutting distances, avoiding traffic jams, and reducing the risk of collisions. AI and ML can also be used to optimise product slotting and replenishment, considering order history and seasonal patterns.
- Algorithms based on AI can analyse historic and correlating data, both internal and external, to predict future market demand, allowing logistics companies to optimise their inventory, transport and staff planning.
- AI and ML in the form of Computer Vision can serve multiple purposes in a warehouse. For example, vehicle location and navigation activities where computer vision can be used to determine location by scanning and recognising the surroundings. It can be used for process analysis, allowing for goods or carriers to be identified throughout the warehouse. It could also be applied for automatic inventory control, making it possible to identify goods or to read and interpret labels.
- There is also significant research being conducted regarding the use of AI and ML in predictive maintenance. AI and ML can be used to predict when equipment is likely to fail by analysing data patterns in different data sets such as sound, vibration or magnetic field profiles, temperature or motor currents. This enables pro-active maintenance and reduces downtime.
- AI-driven chatbots is another growing field when it comes to providing customer support, answering common questions and assisting with shipment tracking. The foundation here is the AI-field of Natural Language Recognition (NLR). This technology could also be useful in supporting self-service of equipment, and training of warehouse personnel and forklift drivers.

Technology: Automation

Driven by rising labour costs, staff shortages, and the general tendency to try and cut costs, as well as the need to become more resilient, automation is growing fast in almost all areas. The growth of automation applies to many different areas of business, such as administration and finance, but we will focus on material handling. In the long run, investments in automated material handling equipment are expected to increase by over 10% annually, even though high transitory inflation and interest rates might put some pressure on investment calculations. The requirement is clear, but technology can still be relatively complex (depending on the demands of the application), which to a certain extent can hinder fast roll-out on a larger scale.



As a general structure, automation can be split into fixed automation and mobile automation, and from an application point of view, it can roughly be divided into handling full pallets, boxes and single units. In short, a multiplicity of possibilities. This means that there is a huge variety of technical solutions on the market, as well as a vast number of suppliers. Since technology development is progressing rapidly, you also have a high degree of creative solutions driven by smaller start-up operations that offer innovative technology, but often lack lifetime support infrastructure.

- Fixed Automation such as fully automated warehouses are traditionally seen as a very powerful solutions when companies are predicting stability in the foreseeable future and are able to invest in a green field. It can fit into all kinds of applications, to accommodate handling pallets, boxes and single units, and can be combined with advanced solutions for order-picking. High throughput, serious technical complexity, big savings but nevertheless very large investments, often exceeding 100M€, has been the norm for a fully automated warehouse. Even though it provides a great return on investment under the right circumstances, its rigid concept drives companies with a more unpredictable future to search for more flexible solutions.
- Mobile Automation is an umbrella name for solutions that can be seen as "moving", e.g. automated robots (AMR's) or automated forklift trucks (AGV's). The clear advantage with mobile automation is that it can be implemented gradually, sometimes just for a certain sub-process. It can also be applied to mixed environments (brown fields) and be upgraded and adjusted to a changing environment. A good example is automation in the early stages of an e-commerce company's activities, who on the one hand want to have a competitive cost level, but on the other hand need the freedom to change and adapt when the company is growing. There are indications that mobile automation is gaining market share on fixed automation, but there is still a long way to go.

Technology: IoT and Connected Logistics

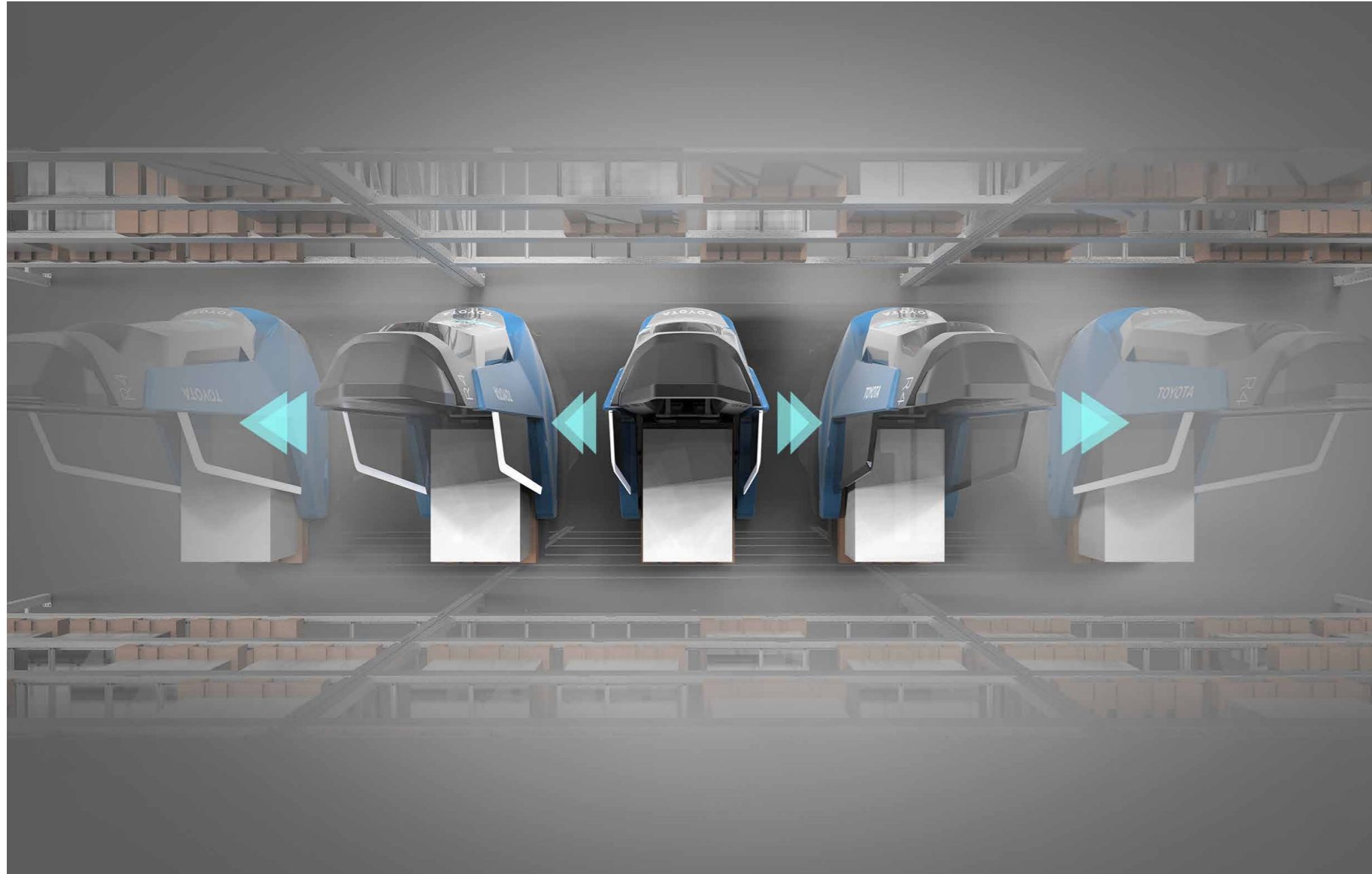
Currently there is significant ongoing development in the Internet of things revolution, and we anticipate an equally swift evolution in logistics over the coming years. Today you will find logistic processes dotted with islands of connected devices like lorries, forklift trucks and other assets, but still it is quite uncommon that entire logistic processes are fully connected, and that information flows freely throughout the process.

IoT also enables objects to talk to each other directly. For example, a package could let an AGV or an AMR know exactly where it is supposed to go and then get delivered without any external input or interference. When this is achieved, significant advantages can be won, having a significant impact on efficiency throughout the supply chain. This is what is meant by the concept of the Physical Internet.

The main IoT technologies emerging are:

- Faster and secure communication methods:** Several communication technologies are developing rapidly right now, enabling fast and secure data transmission of large data sets. A major innovation is the rollout of 5G wireless technology, delivering a greater speed in the transmission of massive data, but more importantly, extremely fast response times, very low latency and encrypted communication. 5G will fully unlock new opportunities and enable e.g. road traffic to be controlled and steered with cloud solutions. However, other similar communication technologies are also being developed equally fast, competing or complementing 5G, e.g. Wi-Fi 6, LoRa and Bluetooth 6.
- Sensors and sensor fusion:** Sensors are rapidly improving, becoming cheaper and easier to deploy which means more assets can be connected to deliver data. These data sets will make complex processes more transparent and easier to understand, enhancing efficiency throughout the respective processes. In logistics it could lead to anything from a better understanding of consumer behaviour to managing traffic more efficiently.
- Blockchain:** With the growing ability to connect and share information in a supply chain comes the necessity for trust - trust that one party can rely on the information and changes that will happen to it. Going forward, Blockchain technology will play an important part in digitising the logistics supply chains of the future.
- Analytical tools:** With the growing number of connected devices, the amount of data collected will grow exponentially. The ability to turn this data into valuable business insights will be key and will require support of modern data analytic tools, step-by-step supported by AI.
- Data sovereignty:** This refers to the concept that data is subject to the laws and regulations of the country or jurisdiction in which it is stored or processed. There are a number of laws and regulations that relate to data sovereignty, such as the GDPR (General Data Protection Regulation) and the California Consumer Privacy Act (CCPA). These laws set out rules for the collection, use, and storage of personal data. Data sovereignty is a matter of growing importance and it affects how businesses, organisations and supply chains that operate internationally use and manage data. It can seriously impact the ability to use and share data in logistic processes across country borders and between international businesses.





Final note

Toyota Material Handling is the global leader in material handling equipment and provides solutions to all kinds of logistics operations. The complexity and the speed at which we see logistics evolve is remarkable, and this evolution will present threats and opportunities to logistics managers depending on where you are in the process.

The purpose of the Trend Report is to provide a summarised picture of what we see emerging in our business, supporting the thinking on how to best embrace and prepare for the future. Still, predicting the future will always be a guessing game and having the agility to flexibly adapt to unforeseen change will be crucial.

If you share an interest in these topics, don't hesitate to contact us to provide your feedback and thoughts. We could also warmly recommend our Logiconomi community where topics like these are discussed and examined in more detail.

For more information, please contact:

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