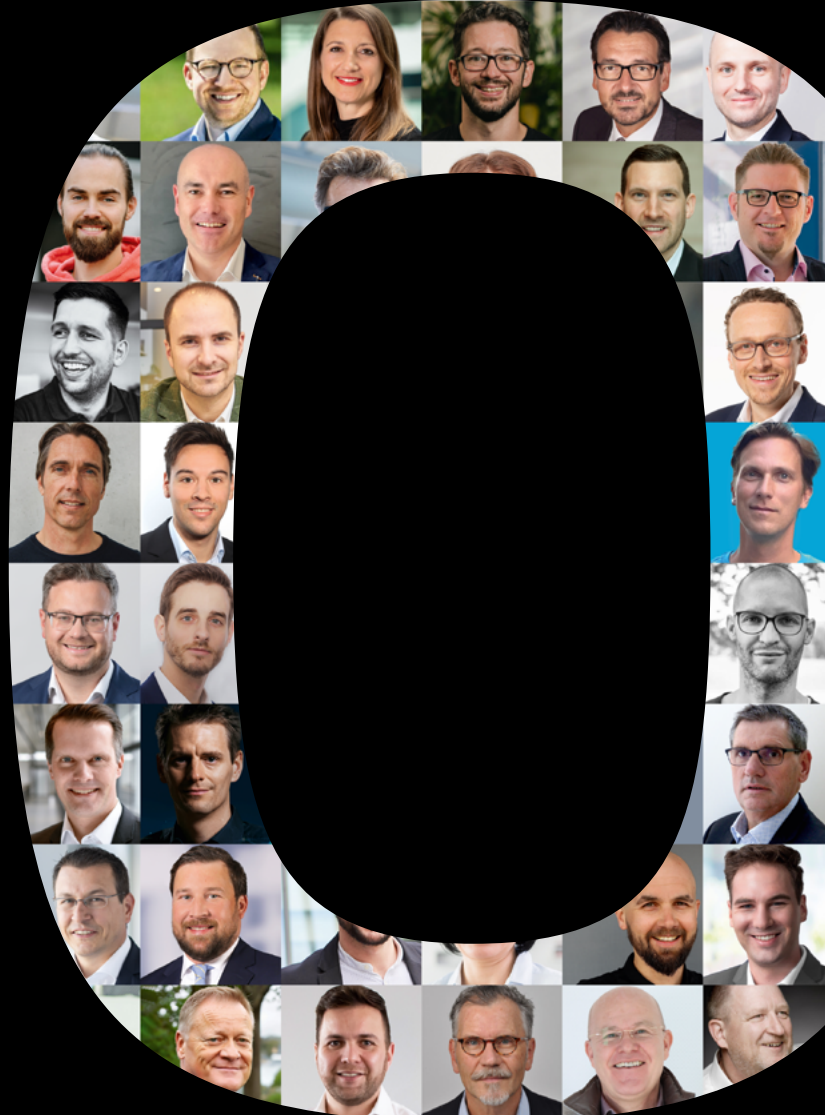


SYNAOS



**Insiders on the
Future of Intralogistics**

**// I never think of
the future. It comes
soon enough. //**

Albert Einstein

**DR. WOLFGANG HACKENBERG**

CEO & Co-Founder
SYNAOS GmbH

<https://www.synaos.com>



Dear readers,

Intralogistics? That's the monotonous and innovation-averse task of moving things from point A to point B. A bottleneck, without added value, without radiance.

For those who still cling to or come into contact with outdated notions like these, I warmly recommend this report.

Because intralogistics is booming.

Never before has intralogistics been as smart and innovative as it is today. Its contribution to the success of companies has never been higher. CEOs have never been more interested in intralogistics – and its future – as they are today.

Rightly so: in just two years, we won't recognize global intralogistics. We are in the midst of a profound transformation.

A transformation that will leave behind those who don't have a clear focus on software and consider concepts like Dark Warehouses, Artificial Intelligence, Social Robots, Digital Twins, and standardized interfaces as modern fads.

Admittedly, the future of intralogistics and its complexity pose numerous fundamental questions for decisionmakers. We aim to empower you to answer them with this report.

The path to the future? Highly individualised for each company. The possible courses of action? At least as diverse as our line-up of thought leaders.

Enjoy the read!

Sincerely,

W. Hackenberg

Aprolis Group (CGM Movincar Spa)	Alfredo Pastor Tella	6
babymarkt.de	Sebastian Borak	8
Boston Consulting Group	Daniel Küpper	10
Bundesvereinigung Logistik (BVL)	Lars Bäumann	12
CLAVEY Automotive Group	Torge Brandenburg	14
Cleia	Vincent Lemonde	16
Continental AG Autonomous Mobile Robots	Prof. Dr.-Ing. Tobias Bornemann	18
Deloitte Consulting	Tobias Exler	20
DFKI	Prof. Dr. Dr. h.c. mult. Wolfgang Wahlster	22
IN3-Group & digit-ANTS	Andreas Holtschulte	24
Fabrik der Zukunft	Tobias Herwig	26
Fraunhofer-Institut IML	Dr.-Ing. Jana Jost	28
Fraunhofer-Institut IPA	Dr.-Ing. Werner Kraus	30
GÖTTING	Patrick Busse	32
GREAN	Dr. Tobias Heinen	34
Harry-Brot	Norbert Lötz	36
Hochschule Hannover	Prof. Dr. Christoph von Viebahn	37
Horváth	Tobias Bock	39
IdentPro	Dr. Martin Welp	40
Chamber of Commerce and Industry (IHK)	Christian Treptow	41
impact media projects	Anita Würmser	43
Intel	Emil Hauch-Jensen	45
ipolog	Matthias Kellermann	47
Irgendwas mit Logistik	Thomas Lührs	49
item Industrietechnik	Florian Palatini	51
Jungheinrich	Alexander Zeilhofer	52
Karter Autonomous Mobile Robots	Patrick van Tiel	53
K. Hartwall	Eero Heinonen	54
Körber Supply Chain	Dr. Kerstin Höfle	56

Lenze	Tim-Oliver Ricke	58
Moving Robots	Javier Miguélez	60
OMRON Electronics	Sven Kaluza	62
	Dr. Klaus Kluger	64
NIMMSTA	Andreas Funkenhauser	66
Open Logistics Foundation	Andreas Nettsträter	67
Pepperl+Fuchs Gruppe	Timo Hähnert	69
ProLog Automation	Markus Zipper	71
SAFELOG	Gérôme Stemmer	73
Schaeffler Technologies	Christian Gladow	75
	Sebastian Jonas	76
	Aaron Zimmerer	77
Schneider Electric	Andrey Albul	78
SLAMcore	Owen Nicholson	79
STEVIA Automation	Paweł Wróbel	81
Styleintelligence (STIQ)	Tom Andersson	83
SYNAOS	Dr. Lennart Bochmann	85
	Dr. Philipp Schäfers	86
TOLSON Consulting	Pierre Skapski	88
Twinzo	Michal Ukropec	90
Wiferion	Julian Seume	92
we all are Robots	Lukasz M. Ziegler	94
	Imprint	96

**ALFREDO PASTOR TELLA**

Head of Mobile Robot Division
CGM Movincar Spa (Aprolis Group)

<https://www.aprolis.com/en/cgmmovincar>



“The introduction of mobile robots for tasks such as material transport and sorting is more than just a trend – it is an operational necessity.”

The Transformation in Intralogistics – a Survival Guide

When we take a look into the future of intralogistics, several key trends and challenges emerge that are fundamentally changing how we perceive and operate in this field. Automation and robotics are on the verge of becoming key components of this transformation. The introduction of mobile robots for tasks such as material transport and sorting is more than just a trend – it is an operational necessity. These technologies, along with intelligent sensors and IoT devices, bring unprecedented efficiency and real-time optimization to intralogistics processes.

However, this growing reliance on digitization comes with some challenges. We now have access to an overwhelming amount of data like never before. While this presents opportunities for AI-driven optimizations, it also poses challenges in terms of data interpretation and security:

the proliferation of connected devices increases the potential for vulnerabilities, making effective cybersecurity measures indispensable.

It is important to dispel the misconception that robots will replace humans. In reality, robots are increasingly designed to work alongside human workers and take on dangerous or repetitive tasks. Moreover, we will see a significant move towards standardization through open-source software and hardware solutions in the future. This makes it easier for different systems and providers to integrate. The decentralization of control units will further enhance resilience and provide greater flexibility in adapting to operational changes.

**// Companies should focus
on scalable solutions. //**

As for competitiveness, companies should focus on scalable solutions that can adapt to increasing operational complexity. Additionally, there should be a clear emphasis on measurable

Return on Investment (ROI) – a balance that becomes even more critical as we witness an increase in acquisitions, where larger corporations acquire smaller, specialized robotics companies.

What is the main challenge in implementing a mobile robot system? People. The importance of training and education should not be underestimated, especially in the context of the skills shortage. Investments in training in robotics, automation, and data analysis prepare the workforce for this new future.

We are at a critical turning point: rapid advancements in automation, data analysis, and globalization are reshaping the world of intralogistics. Companies that can quickly adapt to these changes will not only survive but thrive in this competitive environment and emerge as the true winners of the future of intralogistics.

**SEBASTIAN BORAK**

Logistics Manager & Procurator
babymarkt.de GmbH

<https://www.babymarkt.de>



The Trouble with Automation for Online Retailers

As online retailers, we constantly face enormous challenges. Crises can either bring us tremendous growth, pushing our logistics to the limit, or we plan for growth, lease space, hire people – and then see our revenue decline due to unforeseeable issues.

What we need more than anything else is exceptional agility and, consequently, special adaptability. If we don't recognize the signs in time and act promptly, it can lead to costs in intra-logistics that we want to avoid. There's no secret recipe for this. Instead, we have to give our best every day, keep our eyes open, and anticipate disruptions.

“What we need more than anything else is exceptional agility and, consequently, special adaptability.”

I closely follow the trend of automation and am a big advocate of making ourselves less dependent on human labor. Not because I dislike working with people. Quite the opposite: it's the people that make me enjoy my work every day. However, there are fewer and fewer people available who want to work in logistics centers. But what happens when targets are not met or significantly exceeded? In an automated system, I often have the problem that I can't temporarily eliminate the fixed costs of automation during low workloads. With a high workload, I suffer from the maximum machine capacity and often find it difficult to scale, as is the case with manual operations.

“ In the future, we will definitely continue to move towards automation, but always with the ability to scale. ”

In the future, we will definitely continue to move towards automation, but always with the ability to scale. Another avenue of automation is provided by applications that use true AI and can work predictively. This starts with sales forecasting at the item level and extends to the concept of a “digital twin” and pick optimization. So far, there have been few good products, but developments are progressing rapidly. I’m becoming a real fan of it.

**DANIEL KÜPPER**

*Global co-lead Manufacturing &
Supply Chain, Managing Director and
Senior Partner
Boston Consulting Group*

<https://www.bcg.com>



**Investing in automation
has become more attrac-
tive because labor shortages
around the world are driving
wage levels higher.**

Business Case for investing in Advanced Logistics stronger than ever

Advanced logistics systems are ready for deployment in factory operations. Investing in automation has become more attractive because labor shortages around the world are driving wage levels higher. Collaboration between humans and machines will become more common, creating opportunities for future-oriented jobs. E-commerce players have been frontrunners in deploying advanced automation in logistics to improve productivity, increase flexibility, and accelerate cost reduction. We expect that leading manufacturers will follow their example. By implementing advanced logistics systems, manufacturers can reduce in-plant logistics and warehousing costs by approximately 30%.

The transformative potential arises from the combination of multiple features. **Machine Intelligence:** Major improvements in natural-language processing, computer vision, and sensors enable greater autonomy for devices while enhancing precision and generating vast amounts of data. **Plug and Play:** Advanced logistics systems are quickly set up and integrated into existing factory systems. This is made possible by new service-oriented architectures, better connectivity via IoT, holistic data models, self-learning, and interface and programming improvements. **Adaptability:** Advances in data-processing technologies and access to cloud services enable logistics systems to learn and autonomously adapt to complex, changing environments. AMRs can use machine learning and computer-vision to guide themselves through complex environments. **Mobility:** Battery powering enhances the mobility and autonomy of in-plant logistics systems. Improvements to battery technology and accelerated recharging have increased uptime.

In recent years, AMRs with significantly more autonomy have become available to make point-to-point deliveries and lead tugger trains. When loaded, they travel up to 1.8 meters per second, reducing a human operator's daily walking distance by more than 15 kilometers. Plug-and-play functionality is enabled by VDA 5050, a standardized communication interface, allowing companies to seamlessly integrate AMRs from many different manufacturers. To successfully deploy advanced logistics and quickly benefit from them, industrial companies should follow a six-step approach:

1. Evaluation of the current status, identifying significant weaknesses and value sources that should be prioritized during implementation.
2. Vision and roadmap: Utilize technology solutions to redesign processes, not just to complement existing processes with technology. Creating added value should be the top priority when introducing these technologies.
3. Governance: Building and storing knowledge within the company regarding opportunities, limitations, and risks. Your employees need training and guidance.
4. Establishing the technological backbone during the project's design phase: Connect all logistics systems and devices to the integrated platform. Address security and data privacy concerns, for example, by using secure connections via VDA 5050.
5. Selection of technology and implementation partners: Most companies need to collaborate with external partners to implement modern logistics solutions. Involve them early. Start with a pilot project when working with startups.
6. Measurement and optimization of results: The ramp-up phase for calibrating and implementing new systems often takes several weeks. Comprehensive preparation in collaboration with the technology partner can significantly shorten this duration and reduce the risk of failure.

**LARS BÄUMANN**

*Chairperson Chapter Shanghai
Supply Chain Network
(Bundesvereinigung Logistik, BVL)*

<https://www.bvl.de>



Resilience in the Future: Decentralized Implementation Processes on Unified Data Platforms

Occasionally, the automotive industry experiences massive IT disruptions with global repercussions. Perhaps you heard about it in the media: in late September 2023, a significant IT disruption affected Volkswagen's business processes, causing partial shutdowns. This reminded me of a personal experience in early 2018. Back then, several locations, including logistics, were affected, but to varying degrees. While parts and material supplies came to a complete halt in multiple factories, vehicles continued to be produced, at least partially, in other locations. Why? Firstly, some plants had not just one but multiple production line supply concepts with varying degrees of IT support. Secondly, a gradual decentralization strategy for IT was pursued to achieve greater autonomy.

This could be an important signal for the industry and future considerations regarding the resilience of intralogistics systems: when a severe IT problem occurs in Hall A, it should not impact Hall B, let alone other plants or locations. Individual

locations should function as independently as possible in terms of information technology, and IT issues should be isolated on a small scale whenever possible. Another potential handicap that can have serious consequences is that some companies operate with only one intralogistics concept for production line supply. If the IT system malfunctions, production comes to a standstill. With multiple concepts, responsible parties

could switch to emergency operations, including some manual operations if necessary. By the way, such emergency operations would significantly delay AGVs because they don't rely on real-time connections to a central order management instance and typically have a certain amount of data in their buffer to

Individual locations should function as independently as possible in terms of information technology, and IT issues should be isolated on a small scale whenever possible.

work through. In the long run, all the advantages of AGVs and AMRs will merge into a single mobile robot category.

Regarding the resilience and functionality of future production ecosystems, the theme of autonomy will also prevail. In the automotive industry, assembly lines are tightly linked and synchronized today. A vehicle rigidly goes through hundreds of workstations. If there is a problem at one of the workstations, the entire chain usually stops. In the future, individual work areas on the assembly line will become increasingly autonomous and transformed into decentralized manufacturing cells. Therefore, if there is an issue in one manufacturing cell, it won't immediately interrupt the entire production chain. If an AMR is on its way to a specific manufacturing process and detects a problem, it could automatically move to another workstation and return later when the issue is resolved.

The shift towards a much more closely intertwined human-machine collaboration is a logical consequence of the often-mentioned shortage of skilled workers. The latter is a completely natural process that has been a common thread throughout human history: specialized tasks and trades disappear, while

“ I believe in a fruitful future coexistence of humans and machines. ”

others emerge. For example, there are no longer job profiles specializing in pyramid construction as there were 5,000 years ago. I believe in a fruitful future coexistence of humans and machines: whereas they used to work strictly separately or alongside each other, they will complement each other in the future. Jobs for humans will become more ergonomic, engaging, and responsible.

**TORGE BRANDENBURG**

CEO

CLAVEY Automotive Group

<https://www.clavey.eu>

With Greasy Fingers under the Machinery – Automated Intra-logistics remains a “People Business”

“AI not only enables predictive maintenance but also delivers increasingly precise predictions within interconnected processes involving various players.”

When it comes to digitalization, automation, big data, and AI in intralogistics, there are both opportunities and challenges. The opportunities include the chance to finetune processes, boosting efficiency, and enhancing customer service. By using real-time data, we can identify and minimize bottlenecks before they become major issues. AI not only enables predictive maintenance but also delivers increasingly precise predictions within interconnected processes involving various players. But at the same time, there are challenges to face. Safeguarding sensitive data, implementing complex technologies, and training employees to navigate new systems are all on the table. Integrating different software systems – particularly in the form of currently standalone production ecosystems – is also a formidable challenge that cannot be underestimated.

Here a few aspects that will be particularly relevant from the perspective of a technical service provider:

More Automation: Intralogistics is set to benefit greatly from automation solutions and robotics. Employee shortage: This is not just about using automation for its own sake; it is a response to the realities of the job market (labor shortage).

Faster: Autonomous vehicles, robots, and automated storage and picking systems will ramp up the speed and precision of processes significantly.

More connected: The rapid pace of digitalization is leading to real-time connectivity between all stakeholders and their processes and systems. Clever software solutions allow us to

// Clever software solutions allow us to control and track inventory and transportation with precision, leading to optimized resource utilization. //

control and track inventory and transportation with precision, leading to optimized resource utilization.

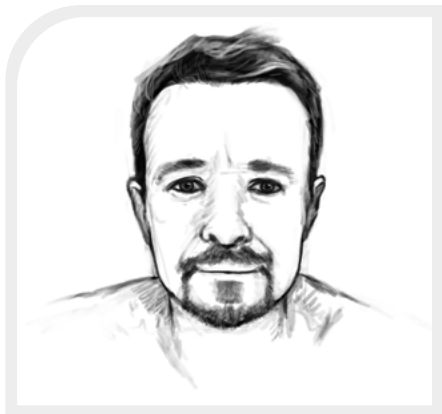
Smarter: Analyzing large volumes of real-time data leads to better decisions and predictions.

AI-powered systems will help identify bottlenecks, optimize maintenance, and make supply chains more effective and resilient.

More sustainable: The industry is placing more emphasis on sustainable solutions to minimize environmental impact. It is not just about following trends; there are positive economic effects. More efficient route planning, reduced packaging, and alternative energy sources will gain importance.

More adaptive: As market conditions shift rapidly, heightened flexibility becomes necessary. Intralogistics companies will strive to develop or adopt scalable solutions in hardware and software that can readily adjust to new, as-yet-unknown requirements.

The ongoing journey of automation, digitalization, and technical advancement will work best if players in intralogistics manage to not only coordinate different IT systems but also keep a constant eye on the machinery's technical availability. Whether it is brand-new equipment, well-maintained machinery, or equipment that has been driven to its limits, the human factor with greasy fingers and noses under the machinery remains crucial.

**VINCENT LEMONDE**

*Business Innovation Manager/
Head of Marketing & Communications/
Electric Vehicle Market LeaderCleia*

<https://www.cleia.fr/en/>



On the Evolution of Energy-Driven Intralogistics

In recent years, we've witnessed remarkable advancements in the field of intralogistics innovations, with automation and flexibility at the core. Forward-thinking suppliers propel the future of the industry.

The scale of today's warehouses serves as evidence of the pace of change. Every month, we hear about new record-breaking facilities handling immense volumes of goods. Such rapid growth is not solely attributed to increasing demand but also to the rise of strategic sectors and the expansion of certain geographic regions. Regions that were once playing catch-up are now leading the charge. Nevertheless, we must also address growing environmental concerns. The infrastructure driving our progress is under critical scrutiny. In many countries, obtaining permits for intralogistics centers has become a significant hurdle. Convincing local and state authorities of the environmental friendliness and humane working conditions of these facilities is a crucial challenge.

This brings us to a pivotal aspect – the software that manages these centers. At Cleia, we are pioneering the concept of “energy-driven” facilities. Here, operations are not just about achieving production goals; they are dictated by available energy resources, ensuring optimal production. This approach not only optimizes production costs but also facilitates the acquisition of certifications like HQE (Haute Qualité Environnementale).

Here, operations are not just about achieving production goals; they are dictated by available energy resources, ensuring optimal production.

Simultaneously, there is a fundamental need to facilitate seamless communication between the facility and its users. A software interface should cater to a diverse group – production operators, factory managers, maintenance personnel, quality controllers. Each group has its own terminology and require-

ments. Furthermore, the design must be inclusive, considering even those who may be illiterate. This inclusivity is reflected in user-friendly interfaces, step-by-step instructions, and clear visual aids.

In summary, intralogistics sits at the center of the challenges our society currently faces. As the sector evolves, it plays a vital role in our collective efforts against climate change. Our commitment

must be unwavering: we must push boundaries, innovate responsibly, and create systems that are not only efficient but also sustainable and inclusive.

“ We must push boundaries, innovate responsibly, and create systems that are not only efficient but also sustainable and inclusive. ”



**PROF. DR.-ING.
TOBIAS BORNEMANN**

*Senior Product Manager
Continental AG Autonomous
Mobile Robots*

*Professor of Production and Lean
Management, University of Applied
Sciences Frankfurt/Main*

<https://www.continental.com/de/>



Smart Factory-bound: Mobile Transport Robots as a Key Element

Increasing complexity, ever shorter innovation cycles, and a growing number of product variants are having an increasingly significant impact on the value networks of the manufacturing industry. Highly volatile markets and tremendous cost pressures are on the rise in an era of globalization. The effects of these phenomena are particularly felt in the production and logistics areas of manufacturing companies.

Against the backdrop of increasingly complex material flows, a close examination of the structures reveals that intralogistics is becoming an increasingly critical element in the factory of the future. Demographic changes necessitate the automation of material flows and simple, repetitive intralogistics activities. In the smart factory, common routines and processes often need to be automated. A crucial element for managing complexity and ensuring resilient logistics flows is mobile transport robots. Depending on their functionality and the selective adaptation of

autonomy levels, these robots play an increasingly important role in the journey toward fully automated material flow. Through superior intelligence in the form of holistic fleet management controls, individual elements can be controlled as needed and deployed purposefully.

Through superior intelligence in the form of holistic fleet management controls, individual elements can be controlled as needed and deployed purposefully.

It will be crucial to reflect physically occurring value-added processes in real-time. Automated and highly flexible production systems in the context of Industry 4.0 will serve as the basis for supplying logistics with real-time information about the current production situation as well as material needs and consumption. By fully integrating sensors in all phases of manufacturing and connecting devices with each other, their data can be used for decision-making, and the corresponding material flow can be optimized in real-time.

“ These fully integrated and holistically networked driverless transport systems continuously and iteratively optimize intralogistic material flows based on data, their analysis, and self-learning algorithms. ”

There will be complete transparency throughout the entire material flow. All necessary information will be available to preempt the risk of process disruptions and stockouts through short-term adjustments to production and material flow processes. In collaborative interactions with digitally connected employees, there

will be flexible supply of production processes that adapts at all times to the quantities, locations, and schedules of demand. Intralogistics chains are fully empowered, as people and machines complement each other and work together integratively.

In the future, it will be crucial, especially in intralogistics, to quickly respond to the continuously changing conditions in the highly dynamic production environment. Mobile autonomous robot fleets are gradually replacing rigid and inflexible logistics systems. These fully integrated and holistically

networked driverless transport systems continuously and iteratively optimize intralogistic material flows based on data, their analysis, and self-learning algorithms. They are the key element on the path to the Smart Factory.

**TOBIAS EXLER**

Partner, Manufacturing Strategy &
Smart Operation Lead Germany &
EMEA
Deloitte Consulting

[https://www.deloitte.com/
global/en.html](https://www.deloitte.com/global/en.html)



“Lean, green, digital” – well-prepared towards the future of Intralogistics

The future of intralogistics presents many opportunities and challenges. In our role as business consultants, we assist companies in implementing automation, AI, and big data. For our *asset-based consulting*, we draw from our pool of software tools and our network of industry partners. We leverage big data and AI technologies to support both us and our clients in decision-making.

Robotics, automation, standardization, and sensor-driven *predictive maintenance* technologies will fundamentally transform production ecosystems in the future, enabling personalized mass production. Especially through a predictive approach – moving from *reactive to proactive* – and its integration into shop floor management, companies will be able to make their production much more flexible. For example, automated production lines will operate largely autonomously. Where human labor is needed in production, AI-supported *collaborative robotics* technologies will be increasingly utilized.

These technologies will handle dangerous or highly repetitive tasks, minimizing the human error rate. Production line breakdowns, overstock, production stoppages, or disrupted logistics flows will then be a thing of the past.

“ By creating digital copies of physical facilities, problem areas can be identified and eliminated at the earliest possible stage, even before they occur. ”

The often-mentioned *digital twin* is the fundamental prerequisite for such virtual pre-planning scenarios. By creating digital copies of physical facilities, problem areas can be identified and eliminated at the earliest possible stage, even before they occur. This is a cornerstone of efficient, flexible, sustainable, and overall intelligent production ecosystems of the future.

Regarding the resilience and competitiveness of companies, we see another key factor alongside agile working methods: it is the adaptability of a company to prepare for disruptions. Companies must develop working methods that enable faster response and action, including training and further education. We observe that resilient companies also have cooperative networks that look beyond factory boundaries and are not trapped in silo thinking.

Also, a focus on sustainability can increase resilience: minimize the intensive use of materials and resources, reduce dependencies on external supply chains. A recent negative example: the container ship that ran aground in the Suez Canal during the pandemic, disrupting global trade. Many entrepreneurs suddenly realized that they should not rely on a single sourcing partner. Therefore, companies should continuously question,

improve, and then digitize their processes. The guiding principle must be: lean, green, digital.

The full potential of digitization can only be realized when processes are designed to be sustainable and then digitized.

“ The full potential of digitization can only be realized when processes are designed to be sustainable and then digitized. ”



**PROF. DR. DR. H.C. MULT.
WOLFGANG WAHLSTER**

*Principal Adviser to the
Executive Board*

*German Research Center
for Artificial Intelligence
(DFKI gGmbH)*

<https://www.dfki.de/web>



Sensors, Low Code and No Code: how Industrial AI revolutionizes Intralogistics

In the upcoming decade of Industry 4.0, AI takes center stage in achieving the next level of long-term autonomy in adaptable and distributed production facilities¹.

Intralogistics is becoming increasingly intertwined with real-time AI-based production control through active digital twins, as demonstrated by SYNAOS and the German Research Center for Artificial Intelligence in the BaSYNAOS project.

Building on digital twins for all logistics components and processes, an industrial metaverse for production facilities is emerging. This metaverse allows for realistic simulation of planned changes and expansions, along with virtual commissioning in intralogistics. This significantly reduces the manual effort required for integration and commissioning. Dual Reality methods, an evolution of Augmented Reality (AR) and Virtual Reality (VR) technologies, enable synchronous coupling between digital twins and the physical intralogistics environment.

Industrial sensor price drops and AI-powered sensor interpretation based on Deep Learning enable active sensor systems. These sensors dynamically focus on recognition tasks in mobile intralogistics systems. Automation in intralogistics can progress towards mobile robot systems through cost-effective retrofitting of manually operated transport systems (i.e., forklifts) using gradual integration of sensors and intelligent control components.

Gradually, Low-Code and No-Code solutions are becoming obsolete as self-programming intralogistics components, based on generative AI, emerge. These components only require skillful prompting of large neural language models (LLMs) by operators.

Building on digital twins for all logistics components and processes, an industrial metaverse for production facilities is emerging. This metaverse allows for realistic simulation of planned changes and expansions, along with virtual commissioning in intralogistics.

// Gradually, Low-Code and No-Code solutions are becoming obsolete as self-programming intralogistics components, based on generative AI, emerge. These components only require skillful prompting of large neural language models (LLMs) by operators. //

Secure “Plug & Produce” based on self-optimizing intralogistics can only be realized through machine learning.

Advancements in AI enable automatic generation of simple apps and API connectors for intralogistics systems when sufficient high-quality training data is available. LLMs are already capable of code generation in various programming languages. As a result, the impact of AI and software development skills shortages, the main obstacles to rapid and widespread implementation of next-generation intralogistics systems, can be somewhat alleviated.

¹Kagermann, Henning and Wahlster, Wolfgang. 2022. „Ten Years of Industrie 4.0“ *Sci 4*, no. 3: 26. <https://doi.org/10.3390/sci4030026>

**ANDREAS HOLTSCULTE**

Founder, Investor, Doer
IN3-Group & digit-ANTS GmbH

<https://www.digit-ants.com>



The Future of Logistics is intelligent, innovative, and integrated

A I, Smart Factory, Industrial Metaverse: Can you already visualize the future of intralogistics? No wonder! It seems within reach – at least if you believe the glossy photos in trade magazines and at trade show booths. I also find it incredibly exciting to imagine how we logisticians will work in the future.

However, a visit to my customers quickly brings me back down to reality. Because the situation I encounter is always similar: companies opt for a fancy, “disruptive” technology, implement it, and expect extraordinary value. But it doesn’t materialize. Even worse, the solution often goes unused and consumes resources. The disappointment is then enormous.

Why is that?

Many companies, whose IT architecture has grown historically, have created a sea of isolated solutions over the years. This is normal and not inherently bad. However, most have missed the opportunity to integrate these solutions into their Enterprise Resource Planning (ERP) or Warehouse Management System (WMS). And that’s precisely the crux of why the promises of digital transformation often go unfulfilled.

Technologies like AI, Big Data, or Digital Twins thrive on being continuously fed with vast amounts of data. To do that, they need

to exchange information through the ERP or WMS system, which is only possible when the solutions are intelligently integrated. In short, for innovative technologies to have any impact, companies must embed them in a robust digital backbone.

// For innovative technologies to have any impact, companies must embed them in a robust digital backbone. //

“ In my opinion, the most crucial step towards the future of intralogistics is to take a step back first. Yes, you read that right: companies must eliminate their isolated solutions before turning to new technologies. ”

So far, we logisticians have primarily focused on the shop floor to save on process costs. The idea: Fewer personnel leads to lower logistics costs. But the equation doesn't add up, and the costs

for warehouse processes continue to rise. From my practical experience, I also know why: Without integration, no automation can take place. It's not uncommon to see administrative staff manually entering data into the new systems, handling bookings and invoices manually, even though it could be entirely avoided – an operational disaster!

In my opinion, the most crucial step towards the future of intralogistics is to take a step back first. Yes, you read that right: companies must eliminate their isolated solutions before turning to new technologies – even if it may be uncomfortable and feel like a step backward.

An intelligently integrated IT architecture may not sound as exciting and doesn't provide fancy press images. But it is the foundation for long-term success in the market AND real innovation. A forward-looking logistics system must be intelligent, innovative, and integrated simultaneously.

**TOBIAS HERWIG**

Business Unit Manager
"Fabrik der Zukunft"
 (Factory of the Future)

<https://podcast.fabrikderzukunft.com>



Factory of the Future: Interplay of Manual and Automated Processes

Intralogistics is undergoing an exciting transformation, primarily driven by the increasing integration of mobile transport robots. In the near future, hardly any factory will be able to do without them. However, despite this visionary perspective, the reality is often more complex. Interfaces to upstream processes and the integration into existing MES or ERP systems, in particular, pose significant challenges.

Intralogistics is a cross-functional discipline. Innovations in this field often stumble when it comes to implementation in ongoing operations. Pragmatic approaches are needed to successfully navigate digitalization. It's not just about controlling the transportation means themselves but achieving comprehensive transparency in material flow. The future – and the challenge – lies in the interplay of manual and automated processes.

**“ The goal is clear:
 Intralogistics must
 provide an increasing
 value to production. ”**

The key lies in intelligently connecting all processes from production to logistics to achieve sustainable and efficient intralogistics. The goal is clear: Intralogistics must provide an increasing value to production, achieved through greater efficiency, reliability, and transparency that minimizes unnecessary transportation and storage.



We have exclusive insights in store for you!

Discover stories about people who synchronize the chaos with intelligent solutions.

Subscribe to SYNAOS Magazin for the inside scoop on an industry in transformation.

www.synaos.com/magazin

SYNAOS

**DR.-ING. JANA JOST**

*Head of Robotics &
Cognitive Systems
Fraunhofer Institute for
Material Flow and Logistics (IML)*
<https://www.iml.fraunhofer.de>



Embarking on the Era of Social Networked Industry – from Mind-Controlled Social Robots to the Role of Humans.

The transformation of logistics and the change of the world as we know it have already begun. While ChatGPT has sparked discussions in the public, AI has already pervaded our daily lives and work, often unnoticed. Robotics is already an integral part of most production facilities and logistics warehouses. Their applications and the automation of processes, in general, are set to expand. This is driven, in no small part, by the shortage of skilled workers and demographic shifts. German companies must collectively confront these challenges and develop solutions to keep pace with the rapid global developments.

A significant common driver of such ecosystems is the development and use of open-source components. The collaborative development of commodity services and the standardization of software through communities can serve as enablers for in-house development. Furthermore, the implementation of new ideas and technologies as open source can be used as the basis for future standards.

“ In addition, considering the challenge of the skilled labor shortage, companies must focus more on creating a human-centered and attractive work environment. ”

In addition, considering the challenge of the skilled labor shortage, companies must focus more on creating a human-centered and attractive work environment. Logistics companies, for example, are already struggling to find personnel for monotonous and physically demanding tasks. Automation can provide significant relief and add substantial value, especially in such areas. Nevertheless, not all processes can be automated. The role of the employee will continue to evolve in the future but will also gain greater significance. Above all, it is essential to reduce the physical and cognitive burden on employees in all processes. To achieve this, AI and especially mobile robotics play a crucial role. For

“ Social robots can detect the employee’s level of attention and adjust their behavior according to the social rules of human-human relationships. ”

instance, employee conditions can be anonymously recorded and processed using AI. Subsequently, technology can adapt its behavior more and more to the individual. Social robots can detect the employee’s level of attention and adjust their behavior according to the social rules of human-human relationships.

Brain-Computer Interfaces may be used in the future as a new way to interact with technology, enabling a natural and intuitive approach to technology. In line with the concept of the Social Networked Industry, these interfaces create social networks that connect people with technology in novel ways in the workplace. This not only transforms the shop floor – it also places a greater emphasis on interdisciplinary development teams.

Sociological, pedagogical, and work science aspects must find their way into engineering and natural sciences. The technological possibilities, such as cost-effective, energy-efficient, and powerful systems, already exist. By combining trends – such as simulation-based AI with social robotics – companies can ensure or strengthen their competitiveness. However, currently, only a few companies are willing to invest in research and innovations or actively drive the topic of open-source development forward. It is now crucial that we collectively take an active role in shaping the use of technologies like social robots and AI, ensuring that both entrepreneurial, societal, and individual challenges are considered when utilizing these technologies.

**DR.-ING. WERNER KRAUS**

*Head of Department Robot
and Assistive Systems
Fraunhofer Institute for
Manufacturing Engineering and
Automation IPA (Fraunhofer IPA)*

<https://www.ipa.fraunhofer.de>



“Smart” was yesterday – Robots of the Future have Cognitive Abilities

Intralogistics processes are a key element for efficient production and warehousing. At the same time, logistics is growing significantly due to the increasing movement of goods. Consequently, there is a noticeable demand for automation solutions with robots. Thus, robotics is likely to enter a golden age. The best-selling segment in the intralogistics environment is by far the autonomous mobile robots that operate in non-public indoor areas. In 2021, approximately 40,000 units were sold, marking a 47% increase compared to the previous year, as reported by the International Federation of Robotics (IFR). It is likely that the actual number is significantly higher, as not all companies report their sales to the IFR.

However, what comes naturally to us humans – i.e., recognizing, grasping, and orderly depositing a desired object – poses challenges for robots. Due to the variety of objects, cognitive robots are needed. These robots, based on captured sensor data and using machine learning, develop an understanding of an object and how to handle it.

“Due to the variety of objects, cognitive robots are needed. These robots, based on captured sensor data and using machine learning, develop an understanding of an object and how to handle it.”

An example of the added value of AI in robotics is AI-based “pick-and-place”, where a robot recognizes, grasps, and deposits randomly arranged components. This application opens numerous possibilities for automation, such as loading machines in production, kitting or assembling components

in pre-commissioning, picking goods from boxes according to an order, and much more. Grasping can be done with model knowledge or in a model-free manner.

**// The trend is moving
towards 'automation of
automation'. //**

Robots are already tackling challenges such as unhooking tangled components or recognizing reflective, thin objects at the bottom of a crate, ensuring that a crate is reliably emptied. The trend is moving towards 'automation of automation': The robot system first learns automatically in a simulation, and what is learned is then applied to the real application. This approach saves time and costs in engineering and significantly reduces the expertise required for commissioning on the user side. Other trends include depalletizing, where a robot locates and depalletizes any containers on pallets in a model-free manner, or handling small load carriers, bottles, beverage crates, and empty containers with robots. Despite all the successes achieved through AI, it is still the case that gripping technology is often a bottleneck, and the dexterity of the human hand remains unparalleled.

Finally, the interface VDA 5050, as the first accepted approach for cross-manufacturer compatibility of mobile systems.

**PATRICK BUSSE**

*Sales and Project Management
for Material Handling Equipment,
Project Engineer
GÖTTING KG*

<https://www.goetting.de>



“ AGVs have become integral to modern production and warehouse facilities. A crucial aspect here is the digital interpretation of images. ”

Five AI-Powered Intralogistics Boosters Shaping the Future

In an increasingly globalized and technology-driven world, businesses face the challenge of enhancing operational efficiency, improving product quality, and reducing costs.

The solution to these challenges is increasingly found in automation, a strategy that integrates AI and automated vehicles.

AGVs have become integral to modern production and warehouse

facilities. A crucial aspect here is the digital interpretation of images. We work with algorithms that analyze real-time camera images to enhance vehicle navigation. We also see opportunities in processing large datasets.

In the future, the advent of AI holds significant potential for intralogistics:

1. Environment exploration

AI can enhance vehicle navigation by creating highly accurate maps and 3D models of the surroundings. This enables precise positioning and continuously optimized map/environmental data.

2. Object recognition and tracking

Real-time AI algorithms can identify and track objects such as pedestrians, other vehicles, obstacles, and traffic signs precisely and reliably.

3. Traffic flow optimization

By analyzing real-time traffic data, AI can help optimize traffic flow. It can predict congestion, suggest alternative routes, and adjust traffic light timings for smoother traffic flow.

4. Weather condition analysis

AI-driven image analysis can contribute to vehicle safety by assessing road and weather conditions. It can adjust speed, warnings, and safety zones accordingly.

5. AGV networking via AI-controlled communication systems

This facilitates real-time coordination among vehicles and even with human workers. Sharing information – i.e. current inventory levels – optimizes overall operations.

In the future, self-learning AGVs are more likely than ever. These systems can continuously learn from experiences and adapt to changing requirements without human intervention. This significantly lowers operating costs and boosts productivity.

Despite these exciting developments, safety and ethics are crucial. Ensuring safety in environments where AGVs interact with humans is paramount. Ethical considerations regarding automation of jobs and potential alienation of human workers must also be considered. Overall, the combination of AGVs and AI holds great promise for the future. However, the associated challenges and risks must be carefully addressed to ensure that the future of AGVs aligns with societal needs.

Despite these exciting developments, safety and ethics are crucial.



DR. TOBIAS HEINEN

CEO
GREAN GmbH

<https://grean.de/de>



Factory of the Future: Adaptable, Sustainable, Urbanly Embedded

Looking at the major trends and challenges in intralogistics, it is increasingly important to broaden our perspective and consider the entire factory as a production system. Especially when it comes to enhancing production sustainability, areas beyond intralogistics and its associated technology play a crucial role. Whether it's the building with its technical infrastructure or the machinery and plant technology, significant opportunities for energy and material savings exist in these areas. In the future, it will become common practice to systematically evaluate, measure, and systematically reduce the carbon footprint of a factory in real-time. Achieving a "zero-emission factory" will become a central metric for production decision-makers.

**“Achieving a
“zero-emission factory”
will become a central
metric for production
decision-makers.”**

Furthermore, it will be essential to develop the factory as a workplace that is attractive to talents in the future. Given the demographic changes, it will otherwise be challenging to find and retain the necessary workforce. Therefore, factories are increasingly being digitized and automated, with customized intralogistics solutions, for example, to reduce the required workforce. On the other hand, factories will return to urban, city-centered quarters to enhance accessibility and attractiveness. Living, life, and industrial work will enter into a new symbiosis.

Lastly, my most important point: In the future, it will be crucial to imbue the factory with a guiding principle: “If you're going in the wrong direction, galloping won't help,” as the saying goes. This applies to production as well: it must be clear what your factory stands for; otherwise, you cannot effectively reach your goals. Depending on which goal is most important to you, the design and organization of your factory will differ.

**// Stay vigilant to
changing market demands
so you can realign
when necessary. //**

Stay vigilant to changing market demands so you can realign when necessary. In this context, the ability to continuously introduce new technology or organizational forms into production becomes increasingly important to meet the requirements of adaptability, agility, and resilience.

**NORBERT LÖTZ****Automation for Sustainable Success**

CEO Production and Technology
Harry-Brot GmbH

<https://www.harry-brot.de>



As industry leaders, we rely on automated solutions. Producing bread and baked goods in large quantities and at a high turnover rate requires an optimized process that would be impossible without automated intralogistics processes. This is why we use driverless transport systems such as AGVs to transport numerous pallets. The ability to handle intralogistic processes flexibly, for example, with AGV systems, will be a significant success factor for future-ready companies.

“For us, as a manufacturer of essential food products, high flexibility is a crucial success factor.”

For us, as a manufacturer of essential food products, high flexibility is a crucial success factor. We always keep the desires of our customers and consumers in mind and need to be able to respond quickly to changes. For example, we currently observe a trend towards smaller packaging units.

However, this has an immediate impact on our supply chains. The number of items to be transported noticeably increases, and all this at a very high speed. We deliver our products fresh to the grocery retail stores daily. Some retailers order their goods for the next day at noon, which we then deliver in the morning with our fresh service. This requires a particularly optimized logistics system.

Sustainability is also a very important aspect. At Harry, we have always focused on a resource-efficient use of our raw materials. Our daily fresh delivery, for instance, allows us to respond quickly to fluctuating demand and significantly reduce food waste. This requires high flexibility. With the help of automation, it is possible to combine cost-effectiveness and sustainability, thus securing a company's long-term success.



**PROF. DR. CHRISTOPH
VON VIEBAHN**

*Professor of Business Informatics
Hochschule Hannover*

<https://www.hs-hannover.de>



Digital Transformation through Collaboration with Universities

Today, decision-makers are feeling the consequences of postponed digitalization and automation projects. A delayed migration to an up-to-date ERP version results in a lot of manual rework and numerous sources of errors in day-to-day operations. Data from ERP, WMS, and MFS systems should be utilized seamlessly within a company and serve as the foundation for modern enterprise management. To achieve this, employees need to be empowered and have the appropriate mindset. Licenses for BI tools, simulation software, and AI should either be readily available within the company or easily procured upon request.

Waiting for a major overhaul five years from now is not sufficient. Transparency regarding resources, processes, and components is crucial today. Image recognition with AI provides real-time data effortlessly, enabling quick and precise responses. Dynamic computer simulations answer “what if” questions about new processes, layouts, and locations. Simulation experiments allow for the analysis of slow days, peak days, and extract precious insights from ERP data from previous years.

“ Collaborations with university partners can help bring fresh insights into these organizations. ”

The level of maturity varies significantly across different industries. Automotive is traditionally a pioneer and uses many of these tools on a daily basis. In other industries, Excel is considered the spearhead of digitalization. Collaborations with university partners can help bring fresh insights into these organizations. On one hand, it's about gaining knowledge of methods and familiarity with the tools. On the other hand, it's about taking the first steps, even if they are small. Working with university partners allows for low-threshold initial steps, whether it's through a student project, a thesis, or an R&D collaboration. Digitalization and sustainability are the most important competitive advantages and development factors for the coming years.

**TOBIAS BOCK**

Senior Manager
Horváth AG

<https://www.horvath-partners.com/de>



POV: Automation as a Transformation Driver for Intralogistics

Due to the ongoing shortage of skilled labor, increased energy costs, and new technologies in hardware and software, the digital transformation of intralogistics will significantly intensify in the coming years. With the increasing automation of both manual processes using mobile robotics, such as autonomous transport systems, and cognitively demanding tasks like planning and control using intelligent software, production processes are expected to be optimized, and dependencies on human labor reduced. Due to the high hardware costs (forklifts, AGVs, etc.), the automation of manual tasks will not happen overnight. However, easily scalable software solutions based on AI for automating cognitively demanding tasks can be implemented more quickly.

“With the increasing automation of cognitively demanding tasks like planning and control production processes are expected to be optimized.”

User-centricity is gaining importance in digital transformation. The design of device features and equipment should aim to provide operators with an intuitive and secure working environment during human-machine interaction. Only user satisfaction through user involvement leads to long-term practical success. The increasing automation, especially of cognitively demanding tasks, is strongly changing existing job profiles. Additionally, it is important to empower those affected by automation in dealing with the new technology.

Production ecosystems of the future will be characterized by a strong collaboration between humans and machines. Increased use of robotics and the automation of planning and control tasks enable highly efficient and effective processes. At the same time, automation reduces lead times, minimizes potential failure risks, increases adaptability, and allows for better scalability of production capacities. Companies can also increase their resilience in intralogistics by relying more on solutions that enable flexibility and reduce susceptibility to human errors.

“ At the same time, automation reduces lead times, minimizes potential failure risks, increases adaptability, and allows for better scalability of production capacities. ”

Through the digital transformation of intralogistics, not only can more efficient and effective processes be achieved, but aspects like flexibility and sustainability can also be realized. The latter, in addition to traditional planning factors like time, cost, and quality, are becoming increasingly important in process design. Many companies still face technical challenges concerning the quality and quantity of available data, which are considered key elements of digital transformation. Ideally, data should be standardized and consistently collected end-to-end by companies. In dealing with automation, there should also be a target vision of digital transformation. Companies aiming to comprehensively address digital transformation should incorporate the target vision into their operating model, covering elements such as strategy, governance and structures, processes, people and skills, and technology, and consistently operationalize it.

**DR. MARTIN WELP**

*Managing Partner
IdentPro GmbH*

<https://identpro.de>



AI Paves the Way into the Industrial Metaverse

When it comes to intralogistics, we always consider the connected production as well as the upstream and downstream transportation. It's already quite clear where the path is leading: the complete real-time digital twin. Real-time is crucial here, as it is the only way to achieve synchronization of all material flows without room for interpretation.

To enable humans to handle the data flood, AI will not only significantly support simulation and optimization but also pave the way to the virtual presentation in the Industrial Metaverse.

“ The demands of industrial customers for complete transparency in the supply chain will significantly grow in the future. ”

The demands of industrial customers for complete transparency in the supply chain will significantly grow in the future. Those who cannot provide their inventory and material movements digitally will be at a disadvantage as suppliers. For this purpose, IoT-based automation for tracking all goods movements (by means of an RTLS, Real-time Locating System) will increasingly replace error-prone manual scanning. And, of course, the use of driverless transport systems and handling robots will also surge as a result.

It can also be expected that the interoperability of system providers will increase through AI-programmed interfaces. This will make medium-term necessary standards less cumbersome or possibly even obsolete.

**CHRISTIAN TREPTOW**

Research & Innovation Robotics & I4.0
Chamber of Commerce
and Industry, Hanover (IHK)

<https://www.ihk.de/hannover/>



IHK Survey among German Companies: 75% want to digitize Workflows

Looking ahead to the coming decade, flexibility and digital innovations will continue to gain importance. The energy crisis, pandemic situation, shortage of skilled workers, supply chain disruptions, and associated uncertainties have highlighted the need for efficient and flexible work processes for businesses. This is evident in the motivations of companies for digitalization activities. According to a 2022/2023 survey conducted by the Chamber of Commerce (IHK) (*editor's note: survey available only in German; similar surveys can be retrieved [here](#)*) organization among approximately 4,000 companies nationwide this year, the percentage of companies using digitalization to enhance workflow flexibility has increased from 51% the previous year to 75%.

Digital technologies are drivers of efficiency and offer many opportunities and potentials to support businesses in addressing current challenges. In nearly all technology fields, the percentage of companies using or planning to use digital technologies

has slightly increased compared to the previous year. Cloud technologies and edge computing, closely related to IoT applications, are widely adopted. Looking at the future use of technologies, AI and Blockchain are emerging as focal points. According to the IHK Digitalization Report, 23% of companies across all industries plan to implement

each of these technologies within the next three years, leading to a need for consulting and support.

Looking at the future use of technologies, AI and Blockchain are emerging as focal points.

The production ecosystems of the future will ideally be self-steering and independent of external networks (wireless, energy, etc.), consisting of various decentralized, flexible units on the shop floor. Additionally, data and its utilization are the keys to new business models and more efficient processes.

Continued from page 41 Evolving customer demands, such as the desire for individually tailored offerings or accessibility through various channels, have also become long-term drivers of digitalization. Competencies in the IT sector are and will continue to

“ From the perspective of businesses, the basics must be established first: digital literacy is essential. ”

be essential. From the perspective of businesses, the basics must be established first: digital literacy is essential. This includes both an understanding of processes and openness to change processes. According to the study, 65% of companies see a pressing need for further training in

this area. In addition, competencies in handling modern technologies (55%) and data protection and IT security (46%) are important.

**ANITA WÜRMSEN**

Journalist, Managing Partner
impact media projects GmbH

<https://www.impact-mp.de>



Four Misconceptions about Innovation

Toss a frog into boiling water, and it will jump right out. But if you put it in cold water and slowly heat it, you'll have a boiled frog in ten minutes. Innovation works in a similar way: companies become accustomed to the heat and even find it cozy at times until they realize what's happening, and by then, it's often too late.

// In the logistics industry, technological transformation is happening much faster than on the road. //

In the logistics industry, technological transformation is happening much faster than on the road, and it will fundamentally change business models. Here, we will focus on four typical misconceptions about innovation.

Misconception #1 starts in the realm of finance and planning. Most companies approach innovation as something linear. They act like all-inclusive tourists who want to know exactly which hotel they will stay at, when the bus leaves the airport, and when they will have dinner. A 1% market share is not reason enough to invest in innovation, especially when it threatens their existing business model and when their order books are already full. However, real-life innovation does not progress linearly; it is exponential. Suddenly, market demand skyrockets, and those without scalable products find themselves in hot water, much like the

frog. In logistics, the danger is particularly great because technological leaps and transformation processes are happening simultaneously across all areas, from transport, handling, storage, and production to AI and data economics.

// Real-life innovation does not progress linearly; it is exponential. //

Misconception #2: Software will change the world. Intralogistics has numerous sad examples of "groundbreaking software meets miserable hardware". The solution is evident and apparent every day: no app, no business, but no smartphone, no app. Software and AI are important, but the right hardware is the key to success.

Continued from page 43

Now, there is plenty of excellent hardware in logistics: stationary and mobile robots, wearables, and gadgets, all autonomous, efficient, and brand new.

This brings us to **Misconception #3**: In the future, it will not be the providers offering autonomous products or comprehensive solutions who will thrive, but those willing to collaborate – beyond the boundaries of their own thinking, with competitors, partners, and customers. True customer orientation lies in the intralogistics zoo, where everything that picks, transports, or

packs not only operates autonomously but also communicates across brands following standardized rules. Open interfaces and standards will determine the commercial success of intralogistics hardware and software in the future.

“ Open interfaces and standards will determine the commercial success of intralogistics hardware and software in the future. ”

Predictions are tricky. The bigger the innovation, the more spectacular the errors. For example, in

1943, IBM's CEO Thomas Watson estimated the global market for computers would be at most five devices. In the late '70s, DEC founder Ken Olsen mused, “There is no reason anyone would want a computer in their home.” **Misconception #4**: Most transformation projects fail because they do not consider societal change.

**EMIL HAUCH-JENSEN**

*Business Development Manager,
Incubation and Disruptive
Innovation (IDI)
Intel*

<https://www.intel.de>



Shift in Focus: Which Automation Solution will give the best Performance?

I believe we will see an expansion of the number of use cases that can be automated. Most of them will be collaborative use cases in dynamic environments where

AI and better sensing will allow the robots to perform tasks that were previously not possible. While robots will continue to get more intelligent, we will also see a push towards standardization and simplification of the intralogistics flows to be better fit for automation. Simply put: standard solutions will be cheaper and easier to implement.

// The best solutions will be those offering the most flexibility and the most levers to squeeze out additional performance. //

We will gradually see a shift in focus from “can it be automated?” to “which automation solution will give me the best performance?”. The best solutions will be those offering the most flexibility and the most levers to squeeze out additional performance. End users will need to look not only at the individual tasks that they are planning to automate, but also at the system level: how well are the various software programs and machinery in the entire factory or warehouse playing together?

Legacy equipment will need to be upgraded or augmented with IoT data collection and control capabilities. The previously used PLC communication is being replaced by new and more modern standards used throughout the whole factory. Devices that lack suitable interfaces are connected to this new communication infrastructure via appropriate gateways. This allows for the establishment of a seamless IoT network. New tools will emerge that allow operators to make sense of all the data that is being collected, providing actionable insights into ways to reduce wasted time and resources. The best tools will be those that allow near real-time optimization and small continuous improvements.

Continued from page 45

Even with a big boost in productivity from the use of AI and robotics the game for manufacturers will continue to be:

- How do I become more efficient?
- How do I optimize between CapEx and OpEx?
- How do I stay ahead of the competition?

Despite all the promises that AI and Robotics hold, we are not going to see a change of employment or a solution to the shortage of skilled labor.

**MATTHIAS KELLERMANN**

Founder & CEO
ipolog GmbH

<https://www.ipolog.ai>



Securing Human Expertise: "Transfer Knowledge to Data Models!"

"A

sssembly is essentially just logistics with a few screws to tighten," the assembly manager of a premium manufacturer told me 20 years ago.

He had long recognized the importance of intralogistics for the efficiency of his production – intralogistics has clearly surged ahead since. However, today there is still a disparity in appreciation in many places: Manufacturing and assembly are considered the *value-adding sphere*, while logistics is often just seen as a *necessary evil*.

How can Big Data and Artificial Intelligence help us find even better solutions? How can we use them to make decisions for

a better planet? I am convinced that structured data will be of great service in this regard. However, fundamental changes are needed: First and foremost, knowledge from people's minds and Excel spreadsheets must be transferred into dedicated data models – the Digital Twin approach needs to be pursued consistently! In many companies, I see only half-hearted implementations, the result is stressed employees and incomplete data. This won't feed AI, nor will it secure the knowledge of the babyboomer generation. I urgently call on all decision-makers to recognize data maintenance as work and allocate time for it – it is tremendously worthwhile!

// First and foremost, knowledge from people's minds and Excel spreadsheets must be transferred into dedicated data models – the Digital Twin approach needs to be pursued consistently! //

Different production disciplines and intralogistics must be closely integrated. For a common language, the USD standard of the "Manufacturing Metaverse," for example, provides an excellent foundation. Equally important, in my opinion, is the willingness to move away from "silo and cost center thinking" and create a shared optimum for production and logistics.

Continued from page 47 Flexibility in intralogistics and production is necessary to satisfy individual customer demands and tackle fluctuations in demand

“ I look forward to the future of intralogistics: Operational control and proactive simulation go hand in hand with data-driven decision-making. ”

and supply chain issues. I see the future in flexible and (semi-)autonomous transport systems, fork-lifts, AGVs, as well as flexible assembly concepts. Many other tasks can be further automated, allowing humans to continue making decisions actively while increasingly entrusting work to robots. I look forward to the future of intralogistics: Operational control and proactive simulation go hand in hand with data-driven decision-making, continuously perfecting production and logistics processes. With creativity, courage to change, and a renewed commitment to excellence, we will make significant progress.



THOMAS LÜHRs

Logistics & Business Coach,
Podcast Host „Irgendwas mit Logistik“

<https://irgendwas-mit-logistik.de>



Upskilling, Reskilling & No-Code – Megatrends in Intralogistics

Megatrends are present in almost every industry and aspect of life. But how is the development shaping up in the field of intralogistics? What trends are emerging? What potential impacts could they have, or have they already had? Nobody can accurately predict what will happen tomorrow. However, much can be inferred:

“Yet, AI systems like ChatGPT will significantly shape the immediate future, even in areas that are currently hard to imagine: Communication with robotics and automation solutions is reaching a new dimension.”

One significant trend undoubtedly will be the ongoing automation and robotics. The capabilities and precision of robots are continuously improving. Even autonomous mobile robots can now perform more than just horizontal transports on flat surfaces. Research institutions like MIT have impressively demonstrated this. Parallel to automation, digitization is advancing, especially due to progress in artificial intelligence. When ChatGPT was first released, many were initially skeptical about it. Yet, AI systems like ChatGPT will significantly shape the immediate future, even in areas that are currently hard to imagine: Communication with robotics and automation solutions is reaching a new dimension. Complex programming tasks that could only be handled by specialists will be replaced by no-code programming or large language models. This will empower anyone to teach machines new processes.

As often is the case, external circumstances lead to technological breakthroughs – such as the shortage of personnel. This phenomenon will certainly be a megatrend of the next decade. However, this transformation process should be designed in harmony with the employees. Those affected by the introduction of digitization and automation in their work areas must be socially supported on this transformative path. Alongside technological trends, buzzwords like upskilling and reskilling will become future

Continued from page 49

// Alongside technological trends, buzzwords like upskilling and reskilling will become future societal trends. //

societal trends. Considering “Future Skills” in the context of digitization and automation will lead to entirely new work methods and processes, as well as a changed awareness of employee training and development. As technologies increasingly take over work processes and humans shift more into process monitoring mode, different methodological and action competencies, as well as social skills, will be in demand compared to today. Studies suggest that by 2027, about six out of ten workers will require further training (Source: Future of Jobs Report 2023, World Economic Forum). This high demand illustrates that training and development will be a megatrend, even in logistics.

**FLORIAN PALATINI**

Head of Sales & Marketing
item Industrietechnik GmbH

<https://de.item24.com/index.html>



The Future of Intralogistics: Automation meets Standardization

Just like in other industries, companies in the field of intralogistics are facing the significant challenge of addressing the shortage of skilled workers and continuously improving the efficiency of their processes. Automation is the big buzzword. However, it's worth taking a closer look at automated processes. Material flow optimization using mobile robots and cobots can only succeed when the entire workflow is considered, from component acquisition to final product hand-over. It's essential to incorporate interfaces and intelligently link processes together. We have recognized this and enable easy automation of loading and unloading processes with our modular system. Logistics companies can thus implement customized solutions, such as the automatic stocking of workstations or FIFO shelves. Processes seamlessly integrate, rendering manual tasks like loading and unloading of robots and cobots obsolete. Instead, we rely on clever mechanisms from Low Cost Automation and the Karakuri field to maximize energy utilization.

“ Equally clear as the increasing level of automation in intralogistics is the trend towards standardization. ”

Equally clear as the increasing level of automation in intralogistics is the trend towards standardization. Systems must be globally deployable. Similar to the VDA 5050 as a communication interface for all driverless transport systems, standardized systems are suitable for robotics and automation solutions. Whether as a foundation for individual cobots or a framework for autonomous mobile robots, what's crucial for smooth operation are compatible components based on a universal concept. In production, even more flexible, modular systems are required in the future. They should be easy and quick to expand and adapt to changing conditions. At the same time, customers worldwide want to trust in a consistent high-quality standard, regardless of whether they operate their systems in Mannheim or Mexico.

**ALEXANDER ZEILHOFER**

*Director Sales Operations
Mobile Robots
Jungheinrich AG*

<https://www.jungheinrich.de>



Location Security requires progressive Thinking

Circular Economy, Artificial Intelligence, Smart Location and Navigation, “Anything as a Service” – what might initially sound like impressive, attention-grabbing terms are, in fact, technologies and trends that will undeniably shape the next five to ten years of intralogistics. Specifically, AI offers significant opportunities: whether it’s demand forecasting in e-commerce or the behavior of mobile robots, handling large amounts of data as a basis for machine learning remains a crucial factor. Companies need to keep their existing infrastructure up to date.

To remain competitive, companies should realistically plan with a reliable partner and select scalable solutions. Mobile robots are a technically sound solution. On the one hand, the initial investment is lower compared to other solutions. On the other hand, expansion within the system, as well as the potential for adding more use cases, is possible.

Location security is becoming an issue for some companies because, unfortunately, Germany has not positioned itself politically and socially as an immigration destination for skilled workers. At least, it seems that, beyond the major cities, we

have lost attractiveness for skilled workers from abroad. How can this be addressed? It will be a mix of solutions!

Alongside acceptance and support for automation as a technology to augment human labor, we need substantial investments and fundamental changes in our education system.

Alongside acceptance and support for automation as a technology to augment human labor, we need substantial investments and fundamental changes in our education system. Without progressive thinking, it won’t be long before the focus shifts from how to relieve forklift operators

with mobile robots to whom will program and maintain these mobile robots.

**PATRICK VAN TIEL**

*Commercial Manager
Karter Autonomous Mobile Robots*

<https://karter-amr.com>



Almost every Company is exploring Automation Solutions

Over the past two years, the market for autonomous mobile robots designed for intralogistics operations has experienced significant growth. Virtually every company involved in internal pallet transport is actively exploring automation solutions. This trend can be observed in companies of various sizes. Despite this widespread interest, many companies are facing uncertainties regarding the appropriate course of action and starting points for their automation initiatives.

At the same time, there has been a notable increase in the entry of providers offering vehicles, software solutions, and integration services. Established players in the intralogistics transport sector are adapting to this development, while an influx of new participants is also evident. As a result, companies seeking automation solutions now have a diverse array of options to choose from. Special attention is given to identifying players who are genuinely driving innovation in this field. The transition to automation in all its forms cannot be simply compared to conventional operational approaches.

With new entrants and shifting dynamics, the automation landscape is both diverse and intriguing.

When considering the future landscape, it remains interesting to estimate which participants will continue to be successful in this industry five years from now. However, the dynamic nature of this market adds to the allure of engaging with it.

**EERO HEINONEN**

*Head of Automation &
Executive Vice President
K. Hartwall Oy Ab*

<https://k-hartwall.com>



Mobile Robots as a Steppingstone to future Production Ecosystems

Intralogistics is on the brink of transformation. Megatrends such as labor shortages combined with new state-of-the-art technologies will reshape the manufacturing landscape and the companies most receptive to new ways of working will reap the benefits. This convergence of innovation promises, on one hand, to redefine how goods are produced, moved, and delivered – and promotes efficiency and much-needed flexibility on the other hand.

“Over the next ten years, a broader adoption of mobile robotics and automation will ensure that more and more companies build resilient and agile production systems.”

Mobile robots have been improving processes in highly standardized industries like the automotive sector for years. They now play a crucial role in intralogistics. Over the next ten years, a broader adoption of mobile robotics and automation will ensure that more and more companies build resilient and agile production systems. Mobile robots will transport goods within warehouses and optimize picking and packaging processes. The same will happen with a growing number of retailers or national postal services where either a lack of standardization or high process complexity has hindered this type of automation so far.

The introduction of autonomous mobile robots often requires adjustments to established processes. However, the adoption of these technologies is no longer just a necessary step to reduce labor dependency and increase efficiency. Today, they are often seen as a necessary “steppingstone” to fully benefit from rapidly evolving technologies such as Digital Twins and AI.

// The need for scalability and the ability to change production processes quickly is a common denominator. This means that flexibility will shape the future of production ecosystems. //

Whether it's the transition to electric mobility in the automotive industry, the demand for same-day deliveries in e-commerce, or the global disruption of supply chains: In most industries today, a competitive advantage comes from the ability to effectively deal with changes and uncertainties. The need for scalability and the ability to change production processes quickly is a common denominator. This means that flexibility will shape the future of production ecosystems. Modular systems, including mobile robots, enable rapid reconfiguration to meet changing demands. Scalable solutions will empower companies to expand seamlessly and avoid disruptions to ongoing operations.

The fusion of Digital Twins, AI, and automation will enhance decision-making by enabling real-time adjustments based on data. Digital Twins simulating intralogistics processes in virtual environments will be the backbone of this flexibility. AI will further enable predictive analytics that revolutionizes inventory management. Intelligent algorithms will forecast demand patterns and reduce inventory levels. Routes, schedules, and resource allocation of mobile robots will be optimized. And all of this can start with an initial project for mobile robots.

**DR. KERSTIN HÖFLE**

VP R&D & Product Management,
Supply Chain Automation
Körber Supply Chain GmbH

<https://koerber-supplychain.com/de/>



“Sustainability comes at a Cost”

Intralogistics, like many other industries, is facing both exciting and challenging times. As someone responsible for product management and development, I eagerly observe technological advancements.

It is evident that (generative) AI will have a significant impact on intralogistics, influencing the way we develop software-based solutions and manage equipment or entire business processes for our customers. The journey ahead is intriguing but relatively well outlined for me, with all its opportunities and challenges.

Education and awareness are two central aspects that we all need to take responsibility for, both within industry and in society. We must acknowledge the risks behind the technology without demonizing it.

Education and awareness are two central aspects that we all need to take responsibility for, both within industry and in society. We must acknowledge the risks behind the technology without demonizing it. In my opinion, the potentials are significant and, when used correctly, will lead to tremendous productivity gains. This is the only way we can address the shortage of skilled workers.

Ultimately, intralogistics involves physically moving goods. While we have witnessed several innovations in mobile robotics in recent years, what else is there? In highly efficient facilities, we move tons of steel to store and transport pallets, containers, or boxes. I particularly hope and expect to see new approaches, especially in terms of sustainability and energy efficiency. Sustainability will take on an increasingly important role, even in intralogistics.

The industry already has some good starting points, although they may not have been highlighted or realized in the past due to different perceptions and willingness to pay. Finding the right balance, especially in terms of cost, will be an interesting challenge. We all know that sustainability comes at a cost. Especially in Germany and Europe, we must ensure that

“ Especially in Germany and Europe, we must ensure that we strike the right balance to avoid losing global competitiveness. ”

we strike the right balance to avoid losing global competitiveness. I see high potential for innovative solutions, particularly in the sustainability realm, which should offer a clear competitive advantage.

Overall, I am confident that there is huge potential and great ideas in both intralogistics and other industries to meet the demands of global supply chains and production networks and secure competitiveness. However, this requires support from policymakers, streamlining, and a healthy level of regulation.



TIM-OLIVER RICKE

*Global Industry Manager Material
Handling & Logistics,
Head of Engineering Intralogistik
Lenze SE*

<https://www.lenze.com/de-de>



Have you ever heard of “Smart Data”?

The predominant trend in intralogistics will be the digitization accompanied using machine learning. Digitization enables comprehensive networking, thus providing significant equipment transparency with high-quality and high-resolution data – currently still limited due to missing management shells – that standardize all content and functional aspects of an asset.

**“ Data analysis supported
by AI will uncover
behavioral anomalies. ”**

Digitization in drive technology will enable the shifting of processes from the control level into the drive controller itself in the next five to ten years, thanks to continuously increasing performance. Data analysis supported by AI will uncover behavioral anomalies. This will significantly shape the transformation from time-based to condition-based maintenance, reducing unforeseen failures while simultaneously lowering energy consumption through optimized operating parameters.

In the past, intelligent, and predictive fault detection in the drive train could only be achieved through enormous amounts of data (big data) obtained with significant effort from practical application and requiring constant evaluation. However, component wear typically does not occur abruptly but develops over time. Accordingly, while fewer data are needed, they need to be of excellent quality and granularity. Informally, this higher-quality dataset is often referred to as Small Data. To reliably achieve proactive fault detection and thereby move towards Smart Data and a Digital Twin, the current technology still requires more intensive time-consuming learning. This is primarily because each application has its own mechanical characteristics.

“ In response to demographic changes and the resulting shortage of skilled workers, the degree of automation in manufacturing will steadily increase over the next years to counterbalance the trend. ”

In response to demographic changes and the resulting shortage of skilled workers, the degree of automation – where economically viable and technically feasible – in manufacturing will steadily increase over the next years to counterbalance the trend. The increased degree of automation will lead to lower labor costs and enable more attractive product positioning in the market.

For this to happen, machines and equipment will need to achieve significantly higher levels of networking, enabling standardized exchange of asset information for respective plant components. With the help of machine learning, these systems will be able to detect operational and production errors early on. This will positively impact required downtimes and maintenance intervals, leading to increased production efficiency. The continuing volatile supply chains require a shift in thinking about material procurement, inventory management, and planning. They will necessitate a “decoupling”, where regional supply chains gain importance.

**JAVIER MIGUÉLEZ**

*Founder & Mobile
Robotics Consultant
Moving Robots*

<https://movingrobots.tech>



The future of Intralogistics is based on adaptability

The world of intralogistics is undergoing a transformative shift, with several key trends reshaping our approach to internal logistics:

Automation – particularly logistics automation through the integration of mobile robots. They can adapt to changing layouts and requirements, making them strong players in operational flexibility. They are already revolutionizing material handling, sorting, and assembly processes in warehouses, manufacturing facilities, and distribution centers.

The power of data – from data capture to data processing and analysis, to feeding AI tools. Data enables real-time monitoring and greater transparency in the supply chain, as well as the implementation of predictive analytics that further optimize operations. When it comes to data, it's important to consider security and ethical guidelines to ensure sustainable growth.

Integrating these trends into everyday operations presents opportunities and challenges for businesses on a human level (and not in the realm of robots):

On one hand, individual talent and training will be crucial as skilled professionals are needed. Building a qualified workforce must be the foundation to efficiently utilize, maintain, and program everything technology offers. Extensive change management is equally important. Introducing new technologies involves more than just swapping out hardware. I often meet people who think automation simply means replacing a manual device with an automated one. But it's not that simple. Efficient automation requires changes or revisions to processes. Soft skills should also be cultivated, as we need people with an open mindset, flexibility, and quick adaptability.

On the other hand, manufacturers and developers of these technologies must establish collaboration networks with experienced integrators who can install, deploy, and provide effective practical support and maintenance to end users. This fosters innovation.

“ We can achieve a production landscape where needs can change, and systems must be flexible and adaptable. ”

This way, we can achieve a production landscape where needs can change, and systems must be flexible and adaptable. Machines will work harmoniously, safely, and interconnectedly, collecting process data that enables better decision-making thanks to AI.

Essentially, the future of intralogistics is about seamlessly merging technologies, leveraging data-driven insights, nurturing and training talent, and creating collaborative ecosystems. With this approach, profitable opportunities are boundless.



SVEN KALUZA

*Business Development Manager
Robotics, Central Region
OMRON Electronics*

<https://industrial.omron.de/de/home>



Quo vadis, Intralogistics?

Some buzzwords have become quite tiresome, don't you agree? Intralogistics is booming, driven in no small part by the "skills shortage", to use another buzzword. However, a multitude of interconnected topics are currently in play, demanding simultaneous attention: How can we integrate AI, Big Data, and digitalization while also addressing ergonomic requirements for workspaces and the need to secure locations? The real challenge lies in liberating all these disciplines from their isolated states, leveraging their synergies, and devising comprehensive solutions for clients.

From our perspective, certain focal points emerge regarding the future of intralogistics. First and foremost, the field of intralogistics is undergoing a complete transformation. What was once a manageable market for providers has transformed into a chaos of over 450 global suppliers of mobile robots in recent years.

“The truth is: Given today's requirements, one provider usually is not sufficient anymore. The VDA 5050, serving as a standard for cross-manufacturer communication among mobile robots, can certainly aid in this regard.”

The truth is: Given today's requirements, one provider usually is not sufficient anymore. The VDA 5050, serving as a standard for cross-manufacturer communication among mobile robots, can certainly aid in this regard. On the flip side, challenges often lie in the details. The foundational platform of a mobile robot is just one part of the solution. Things get interesting when questions arise about integration – in other words, what kind of add-ons are required? How is the hand-over handled? Does my wireless network capacity

suffice if I want to collect more and more data and analyze it in real-time? How do all my robots harmonize with human interaction in daily operations? What about service and maintenance? Lastly, who takes overall responsibility for the facility?

Consulting services for such complex projects will see a rise in demand in the coming years. Future readiness means being flexible, quick, and adaptive. Changes must occur without disrupting production. This necessitates planning tools that go beyond mere CAD drawings.

The Digital Twin is another buzzword. It allows us to identify bottlenecks during the planning phase through real-time simulations in a seamless 3D environment. However, mastering and implementing this discipline is a learning process. It requires time. Yet, post-COVID, time seems scarcer and therefore more precious. A vicious cycle, isn't it?

**“ So called ‘Dark
Factories’ are still far away
from being a reality. ”**

So called “Dark Factories” are still far away from being a reality. What holds value now are partnerships of all kinds. Manufacturers and customers seek solution providers who can accompany them throughout their entire intra-logistics journey. Software will play an increasingly crucial role, particularly in orchestrating mixed fleets. What we also need is courage. Courage to embrace the new, courage to learn from mistakes, and courage to break away from old thought patterns. The journey itself is the destination, and through it, we collectively achieve location security and enhance the appeal of workplaces.

**DR. KLAUS KLUGER**

General Manager, Central Eastern
Europe
OMRON Electronics

<https://industrial.omron.de/de/home>



Ignite the Flexibility Turbo for Future-Proof Intralogistics!

Climate change, uncertain supply chains, evolving customer demands, and the difficulty in finding skilled personnel – companies are grappling on all fronts to streamline operations in manufacturing, warehousing, and beyond while alleviating the burden on their employees. Managing intralogistics and the transport of materials and goods within a factory demands flexible, scalable, and future-ready approaches and technologies. Trustful partnerships are the cornerstone of an efficient and sustainable Smart Factory.

A study by BVL found that over 80% of surveyed companies are calling for increased use of AI and automation in intralogistics to address challenges like the shortage of skilled workers. Action is urgently required as every second company, according to an Ifo survey reports significant limitations due to the skilled labor shortage. Intralogistics provides a solid starting point for instigating change with technologies such as mobile robotics, cobots, or virtual fleet management.

“ Intralogistics provides a solid starting point for instigating change with technologies such as mobile robotics, cobots, or virtual fleet management. ”

The goal is not just to improve individual processes but to create synergies and streamline production workflows. Big data takes control, collaboration between humans and machines must be intensified, and strategic approaches to security, data protection, and ethics need to be addressed.

The implementation of a decentralized management system is also being advanced as part of the Smart Factory development.

Modern intralogistics includes elements like mobile robots. They increase throughput, minimize errors, optimize material traceability, and enable employees to focus on tasks that require complex human skills. For instance, the car manufacturer BMW relies on this technology to transport materials. They are equipped with a conveyor attachment (load handling device). Intralogistics

also encompasses delivery logistics, in-house movements, conveyors, forklifts, high-bay warehouses, SCARA robots, cobots, and more. There are many areas where companies can improve processes, relieve employees, save time, and become more efficient.

The standardized communication interface VDA 5050 enables better utilization of the potential of mobile robotics, as it seamlessly integrates vehicles from different manufacturers into fleet management and allows for more efficient operation. For example, order and traffic management can be merged on a single user interface.

// The standardized communication interface VDA 5050 enables better utilization of the potential of mobile robotics. //



ANDREAS FUNKENHAUSER

CEO & Founder
NIMMSTA GmbH

<https://nimmsta.com>



From your Hand to the Cloud: Smart Industrial Wearables bring significant Efficiency

The future of intralogistics is characterized by seamless integration of robotics, automation, and standardization. This transformation is driven by pioneering, innovative technologies, including industrial wearables that an increasing number of companies are already using.

In these future ecosystems, robots and autonomous systems will cooperate hand in hand with human workers. Automation spans the entire supply chain, from warehouse management to picking and packaging. Standardized interfaces and protocols enable smooth communication among different components.

Smart industrial wearables, such as smartwatches, offer a multitude of benefits that significantly enhance efficiency, safety, and accuracy in warehouse management and logistics. Communication between logistics personnel and systems is crucial in this regard.

“ Smart industrial wearables, such as smartwatches, offer a multitude of benefits that significantly enhance efficiency, safety, and accuracy in warehouse management and logistics. ”

Implementing such a smartwatch provides intralogistics workers with access to bi-directional communication. This means that data like inventory levels, shortages, or inventory information can be sent in real-time from the back of the hand to the (inventory management) system. This optimizes processes and minimizes errors.

The intralogistics industry is facing exciting changes. Those who embrace these new technologies will be able to meet the demands of a changing global economy and remain competitive.

**ANDREAS NETTSTRÄTER**

CEO

Open Logistics Foundation

<https://openlogisticsfoundation.org>

“Digitalization must not be an end in itself” – Everyone benefits from Open Source Solutions

The ongoing digitalization in intralogistics has led to the emergence of numerous isolated solutions in the system landscape over the past years, much like in many other areas of logistics. Each company has pursued its own digitalization and IT strategy, often resulting in the development of proprietary solutions.

Consequently, digitalization frequently stops at the boundaries of companies because the systems are not compatible beyond that point. However, digitalization in logistics should not be an end in itself; instead, it should make logistics as a whole faster, more stable, and more efficient.

“Consequently, digitalization frequently stops at the boundaries of companies because the systems are not compatible beyond that point.”

Therefore, open solutions are needed – solutions that transcend interfaces and are available to all. The European member network of the Open Logistics Foundation is therefore working on common open-source solutions. It focuses on the services and offerings of companies that do not different-

iate them from competitors and can become significantly more efficient through standardization.

Typical use cases for non-market-differentiating components in intralogistics include basic warehouse functions. These include warehouse strategies, the definition of load carriers, interfaces for cross-system energy monitoring, or interfaces to transport systems. For example, the Open Logistics Foundation’s repository has already published a reference implementation for the VDA 5050 standard, created by the Fraunhofer Institute for Material Flow and Logistics IML.

Continued from page 67 Developments like these can and must also be collectively carried out, maintained, and further developed by companies. Going it alone by providers results in significantly higher costs and additional efforts on all sides.

Companies in intralogistics are therefore invited to advance their digitalization based on open source and standardize logistical processes through de facto standards and practical open source software. The potential is substantial.

**TIMO HÄHNERT**

Sales Engineer Factory Automation-
Pepperl+Fuchs Gruppe

[https://www.pepperl-fuchs.com/
germany/de/](https://www.pepperl-fuchs.com/germany/de/)



Standardization ensures Interoperability

The intralogistics industry is facing an exciting future characterized by numerous trends that will have a significant impact on sensor development. One of the central trends is the ongoing digitalization. Companies in intralogistics will increasingly need to adopt digital technologies to make processes more efficient and leverage real-time data. Big data AI will play a key role in this context, enabling the analysis of data streams to make informed decisions and optimize resources – addressing the issue of a skilled labor shortage.

Pepperl+Fuchs sees significant opportunities in this environment, as the company is already a well-known, reliable, and innovation-driving partner in the sensor industry. Integrating digitalization, big data, and AI into its products will allow it to offer innovative solutions and position itself as an industry leader.

The production ecosystems of the future will be heavily influenced by robotics, automation, and standardization. Intralogistics will increasingly need to rely on autonomously operating robots and systems to optimize their production processes and enhance quality. Standardization will ensure the interoperability of different technologies and systems, thereby increasing production efficiency and flexibility.

“ Standardization will ensure the interoperability of different technologies and systems, thereby increasing production efficiency and flexibility. ”

To strengthen resilience in intralogistics and remain competitive, companies should focus on a diversified supply chain and prepare for alternative sources of procurement. Investments in employee training and development are equally important to address the challenges posed by the skilled labor shortage, as even AI requires skilled professionals.

Continued from page 69

Securing the location requires close collaboration with governments and regional stakeholders to develop long-term strategic solutions.

“ To strengthen resilience in intralogistics and remain competitive, companies should focus on a diversified supply chain and prepare for alternative sources of procurement. ”

Overall, the intralogistics industry is entering exciting times, but also facing demanding challenges that can be addressed through innovative approaches and technologies.

**MARKUS ZIPPER**

CEO

ProLog Automation

<https://prolog-automation.de>

“For customers, it is increasingly important to purchase flexible systems that they can adapt or modify themselves.”

Human-Robot Collaboration will increase

Driverless transport systems with collaborative robotics will undoubtedly become more important. The topics of service and assistance robotics are also gaining ground. For customers, it is increasingly important to purchase flexible systems that they can adapt or modify themselves. The systems must also be scalable and, in some cases, integrable into mixed fleets.

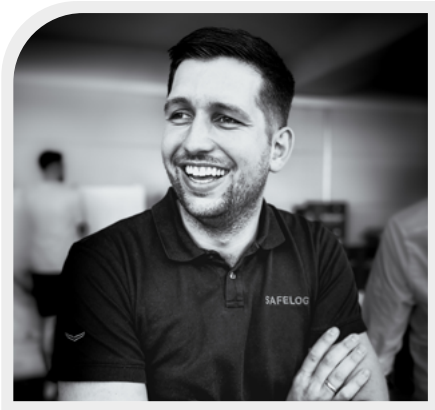
For manufacturer-independent service providers like us, the challenge in terms of digitization, big data, and AI lies in staying up to date. Looking ahead to the production ecosystems of the future – especially with regard to robotics, automation, and standardization – we mainly see two themes:

1. Production lines will be made more flexible to quickly adapt to changing requirements. Robots and automated systems will be able to perform various tasks and seamlessly integrate into various production processes.
2. Collaborative robots: Human-robot collaboration will continue to grow. Cobots work alongside humans and assist them in complex tasks. They will become safer, smarter, and easier to program, enabling greater flexibility and versatility in production.

To remain competitive, companies should open themselves up to the integration of advanced technologies such as automation, robotics, IoT, and AI. They significantly improve the efficiency and accuracy of intralogistics processes. Automated warehousing systems, autonomous vehicles, and intelligent warehouse management systems can increase productivity and reduce reliance on manual processes and labor shortages.

Continued from page 71 Recruiting skilled workers is becoming increasingly difficult. That's why it's crucial to consistently develop a strategy for automation in intralogistics and production. Non-value-added tasks must be automated out of necessity, and the solutions should be cost-effective, flexible, and scalable.

“ To remain competitive, companies should open themselves up to the integration of advanced technologies such as automation, robotics, IoT, and AI. ”

**G R ME STEMMER**

Director of Sales
SAFELOG GmbH

<https://www.safelog.de>



Automation – Hype or Magic Bullet?

The hype surrounding Mobile Transport Robots in intralogistics continues unabated, and it's understandable given the shortage of skilled labor on one hand and technological advancements on the other. However, the media often gives the impression that this technology is already in widespread use when, in reality, only a few companies are using mobile robots extensively for complex processes. Furthermore, the acceptance of this technology and robotic colleagues varies from industry to industry.

“ Market research firms like Interact Analysis predict that the market for transport robots will grow by up to 40% annually. ”

Market research firms like Interact Analysis predict that the market for transport robots will grow by up to 40% annually. However, the automation of intralogistics with the help of mobile robots is at varying stages of advancement in different industries. While the automotive and OEM sectors adopted intralogistics automation solutions early and possesses relevant expertise, other industries have often not progressed beyond automating selected production steps. The linking of assembly stations or the connection between picking and shipping is often still carried out using manpower or human-operated forklifts in these industries.

A very effective approach to making the technology accessible to more industries, in my view, is the creation of industry standards and research projects at colleges and universities. For example, the VDA 5050 interface allows mobile transport robots from different manufacturers to operate together under a central control system. This expands the range of possible applications. University research forms the second important pillar for improving market acceptance of mobile robots. In places like the proto_lab at TH Rosenheim, use cases for Mobile Transport Robots in SMEs are being tested.

Continued from page 73

The development of a cost-effective fleet manager, research on automated parts supply, workplace linking in craft businesses, and other small and medium-sized enterprises are the foundation for bringing the technology into new areas. Through standardization and research, the costs of entry into automation with mobile transport robots can be reduced, eliminating a significant hurdle.

**// Automation is not a
panacea for the skilled
labor shortage. //**

Automation is not a panacea for the skilled labor shortage, but it can help concentrate human labor in areas where it is currently indispensable.

**CHRISTIAN GLADOW**

VP Digitalization & Operations IT
Schaeffler Technologies AG & Co. KG

<https://www.schaeffler.de/de>



Heterogeneous Process Diversity: Interoperability enhances Value Creation

Schaeffler is significantly influenced by a variety of options in both products and processes. When combined with an above-average level of value creation, there arises a necessity to have a positive impact on flexibility within the value chain through digitalization. Only in this way can we meet a wide range of customer requirements.

Regardless of the logistics solution, we are looking for partners who can take into account and integrate the heterogeneity prevalent in our organization with a variety of digital solutions along the supply chain. Ultimately, interoperability between the individual solutions must be ensured to generate real benefits from the value stream perspective.

“ Ultimately, interoperability between the individual solutions must be ensured to generate real benefits from the value stream perspective. ”

**SEBASTIAN JONAS**

VP New Production Concepts
Schaeffler Technologies AG & Co. KG

<https://www.schaeffler.de/de>



Innovation Centers and Hands-on Experience: Focus on Employees

“ Employees are involved in the decision-making process as early as possible, including the ideation phase, and are continuously and transparently informed about the current project progress. ”

Autonomous mobile robots, cobots and mobile cobots, camera and sensor technology, as well as AI-based algorithms for environmental recognition and low-code programming of robots – we have the entire field in view and are already implementing these solutions in our production. New technologies are initially tested in our innovation centers before being put into serial testing and ultimately operation in one of our factories.

Employees are involved in the decision-making process as early as possible, including the ideation phase, and are continuously and transparently informed about the current project progress. Furthermore, our innovation centers offer extensive opportunities for hands-on experience with cutting-edge technologies through active testing and experimentation.

**AARON ZIMMERER**

*Project Management Automation
& AGV, Automotive Division
Schaeffler Technologies AG & Co. KG*

<https://www.schaeffler.de/de>



Fully Connected Intralogistics: “Technology is only as good as its Users”

In my view, digitalization plays a central role, especially in the field of intralogistics. On one hand, by using and networking technologies that were previously considered in isolation, such as cobots, AGVs, AMRs, and peripheral devices like sensors or cameras, companies have the opportunity to react flexibly, quickly, and proactively to external influences.

On the other hand, with a seamless network comes the inevitable development of IT and OT security as a crucial foundation for the digitalization and automation of intralogistics. Every new IT system or tool must, therefore, be assessed with an iterative

approach, such as a security-by-design process, and continuously examined for technical and organizational vulnerabilities. Regardless of the opportunities and risks associated with digitalization and automation of intralogistics, the human factor will not be left out. After all, technologies are only as good as the people who use them.

“ Every new IT system or tool must, therefore, be assessed with an iterative approach, such as a security-by-design process, and continuously examined for technical and organizational vulnerabilities. ”

**ANDREY ALBUL**

Global Business Development Director,
Intralogistics and Warehousing
Schneider Electric

<https://www.se.com/ww/en/>



The Future of Intralogistics – three important Key Challenges

Intralogistics is facing several challenges that are relevant to both end consumers and Original Equipment Manufacturers in the market:

Now, as the market enters a correction phase, the focus has shifted to efficiency. With a wide array of tools at our disposal, ranging from robotics and AGVs to AI, there are numerous opportunities for process optimization.

1. During the pandemic, there was a massive surge in market investments, with retailers particularly eager to expand. The quickest and simplest way to manage this growth was by attracting new labor forces. Now, as the market enters a correction phase, the focus has shifted to efficiency. With a wide array of tools at our disposal, ranging from robotics and AGVs to AI, there are numerous opportunities for process optimization.
2. The talent shortage is also a pressing issue. On one hand, it's becoming increasingly difficult to find or attract skilled professionals in automation and robotics, while on the other hand, the market for IT talents is expanding significantly. This opens the door to new automation concepts that are poised to dominate the market over the next decade and are much more aligned with IT than OT.
3. Furthermore, sustainability is a central challenge. Sustainable operations encompass more than just recyclable packaging, electric delivery vehicle fleets, and other customer-facing aspects. It also involves optimizing resources used during product storage, sorting, and other energy-intensive processes, such as maximizing the utilization of AGV fleets or electrifying processes that rely on compressed air. And this is just scratching the surface.

The intralogistics market holds great growth potential. But it must grow sustainably, whether through reducing manual labor or harnessing AI for AGV fleet management.



OWEN NICHOLSON

CEO
SLAMcore<https://www.slamcore.com>

Computer Vision as the Common Language for spatial Machine Intelligence

The future of warehouse and factory logistics relies on shared spatial intelligence. Local information is captured, analyzed, and shared in real-time to optimize the entire operational space at the system level. This approach ensures maximum speed, efficiency, and safety. The key to success is having a universal language of spatial intelligence that applies to all products.

At SLAMcore, we firmly believe that Computer Vision is at the heart of creating this universal language. We've partnered with SYNAOS to develop a complete real-time location system based solely on vision, providing centimeter-accurate positioning data. Some of our customers are autonomous mobile/guided vehicle companies. They use our vision-based algorithms to enhance the positioning accuracy of their vehicles in large, dynamic environments. But visual data can offer more than mere position information. Leveraging the latest advancements in AI, video data can be analyzed to read text and barcode information, identify specific objects, and provide contextual insights into what is being observed. All this higher-level information is captured in a global map and anchored in both time and space, using a standardized format applicable to all products utilizing Computer Vision as a core component.

“ We will observe a growing performance gap between products that use Computer Vision and those that do not. ”

We will observe a growing performance gap between products that use Computer Vision and those that do not. However, it doesn't need to be a battle of the sensors. While we are experts in Computer Vision, sensor fusion is equally important. The best systems make use of multiple sensor modalities. LIDARs are highly accurate when functioning optimally, Ultra-Wideband Beacons excel in open spaces, and, where possible, installing magnetic tape provides extreme

Continued from page 79

Computer Vision can be introduced gradually, running in parallel with existing sensor systems, adding incremental value as companies embark on this journey.

reliability. Computer Vision combined with sensor fusion can be employed to build a complete spatial intelligence system that is greater than the sum of its parts. This means that companies considering the adoption of Computer Vision today don't need to redesign their products from the ground up. In fact, we strongly advise against it. Computer Vision can be introduced gradually, running in parallel with existing sensor systems, adding incremental value as companies embark on this journey.

We are in an incredibly exciting era for logistics as our industry matures and standardizes its offerings. We are entering a phase where companies will compete on more than just price. This will drive innovation as we seek to expand capabilities through new designs. When new products enter the market, it is critical to consider how they will communicate with other products. Otherwise, we risk, at best, frustrating end customers and, at worst, severely limiting the scalability of our entire industry. Computer Vision will be at the center of this next phase of logistics.

**PAWEŁ WRÓBEL**

Managing Director
STEVIA Automation

<https://stevia-automation.com>



Hesitant to automate? *Automation as a Service* lowers Barriers

The intralogistics industry is still growing, despite the challenges posed by the COVID-19 pandemic and global political instability. On one hand, the role of human labor in production and warehouse processes has decreased. On the other hand, this has proven to be highly useful in the context of a global pandemic, as automated systems have demonstrated resilience against disruptions like pandemics. In the near future, robots will reliably replace repetitive, mundane, and hazardous tasks previously performed by humans, enhancing competitiveness.

As a result, there is a rapid increase in global demand for automated warehouse systems. Currently, automation and robotic systems are primarily utilized by large companies with strong

market positions and reputations. However, over the next five to ten years, this landscape is expected to change, with smaller companies showing increased interest in automated intralogistics systems. Their top priority now is to enhance the speed and accuracy of order processing, thereby reducing delivery times. We observe a trend where smaller companies start with individual installation components, such as automated sorting systems or robotic units, and gradually incorporate more automated and scalable system features.

// Smaller companies showing increased interest in automated intralogistics systems. Their top priority now is to enhance the speed and accuracy of order processing, thereby reducing delivery times. //

Automation as a Service is set to gain popularity in the coming years. This approach assists smaller companies in implementing automation systems. The strategy behind *Automation as a Service* is based on the principle of outsourcing automation systems and engineers, significantly reducing the investment cost for the company. This could be particularly appealing to those who are still hesitant about adopting automated systems.

Continued from page 81

While AI can replace many human tasks, its greatest advantage lies in data collection and analysis. It enables better order prediction and precise replenishment of warehouses. Speed is crucial, as customers now expect same-day or next-day delivery. AI identifies optimal routes for people, mobile robots, and the flow of goods, as well as aids in deciding how goods should be arranged on shelves to minimize picking routes and times. AI development also presents numerous opportunities for software developers, as it can expedite project completion by generating portions of software code.

Modern production ecosystems should integrate all automation elements, production systems, and business applications.

Modern production ecosystems should integrate all automation elements, production systems, and business applications. Storage, transport, and distribution should merge into one comprehensive system, providing maximum transparency and ensuring high information throughput. The key lies in developing communication interfaces and integration tools among all these systems.

Our company is located in Poland, where technical universities are highly popular among young people. We consider it our mission to offer stable job opportunities to graduates in their home country. Poland is rapidly developing, and we are witnessing a growing interest in industrial automation in our region, not only among large corporations but also among smaller companies.

**TOM ANDERSSON**

*Principal Analyst & Co-Founder
Group Founder
"Tech London Advocates" &
"Global Tech Advocates"
Styleintelligence (STIQ)*

<https://www.styleintelligence.com>



Standardization: Worth taking the Risk?

The main trend that will shape the intralogistics industry in the next five to ten years will be the continued and increased growth of automation across various sectors. This includes mobile robots, picking, industrial robots, and other machinery. Autonomy will also play an increasingly significant role.

The biggest challenge for many companies could be knowing and understanding how to effectively utilize the data collected during the pandemic. Since this was such an unusual event, it may not be part of the "normal data flow". That means if you mix data from the pre-pandemic period with data collected during

the pandemic, you may receive very positive forecasts that may not, however, reflect what is actually happening. So, should companies ignore data from pandemic times, or should they "normalize" it to be able to understand or interpret it? One opportunity in all of this may be that companies could draw conclusions about their future, spanning the next five to ten years.

“The biggest challenge for many companies could be knowing and understanding how to effectively utilize the data collected during the pandemic. Since this was such an unusual event, it may not be part of the ‘normal data flow’.”

Standardization will play a key role in the future, especially in how machines communicate with each other. However, this may also apply to some customers where there is still some convincing to be done: Can providers persuade customers

to use standardized products that may require them to change their own processes or rewrite code that has been stable for a decade? This might be the more significant question.

Whether a company remains resilient in this competitive environment depends on the company itself, its growth, and its future plans. Some companies need to remain agile and may need to

Continued from page 83

introduce more flexible automation, while others that rely on stable operational processes may need to implement more efficient automation. It is becoming increasingly challenging for companies to know which automation and/or software to adopt due to the influx of many new providers in recent decades.

**// Standardization will
play a key role in the
future, especially in how
machines communicate
with each other. //**

Ensuring they stay up to date with the production ecosystem and external influences could be crucial in understanding how to approach solutions for individual problems.

**DR. LENNART BOCHMANN**

CPO & CRO, Co-Founder
SYNAOS GmbH

<https://www.synaos.com>



“There is no doubt that complete connectivity is coming.”

Four Hypotheses on the Future of Intralogistics

1. Complete connectivity is coming – and it will hurt at first. The major topic of digitization will occupy intralogistics for at least another five years. There is no doubt that complete connectivity is coming. And that it will hurt at first. Because it costs money, because it makes inefficient processes visible, and because it reveals previously wasted value creation.

2. Intralogistics is transforming: from black box to CFO darling. Where supply chains have been optimized down to the last pinion, processes in factories and warehouses have remained sparsely illuminated. This is about to change radically. Intralogistics will no longer be a black box. Future-proof intralogistics will become a value driver, and an ROI – the return on intralogistics – will be concretely quantifiable.

3. The era of efficiency is moving software into focus. Humanoid robots will both scare and impress us all. Intralogistics hardware – robots, vehicles, machines – will nevertheless be outoptimized near-term. In the future, significant leaps in efficiency will take place exclusively in the software domain. The guiding principle “just make it work” will be replaced by “make it work in the right way” – with (resource) efficiency as the central paradigm.

4. Individual solutions will consolidate into platforms. Where production and logistics merge into an overarching value-creating machinery, standalone IT solutions will lose their raison d’être. What will prevail are solutions that scale small process improvements on a large scale and enable value-added applications “on-the-ground,” such as Augmented Reality. At their core, these will be intelligent platforms on which individual solutions consolidate into harmonized and interoperable entities.

**DR. PHILIPP SCHÄFERS**

*Head of Partner Management &
Business Development
SYNAOS GmbH*

<https://www.synaos.com>



Optimization of Intralogistics Fleets: Increasing Importance of Software

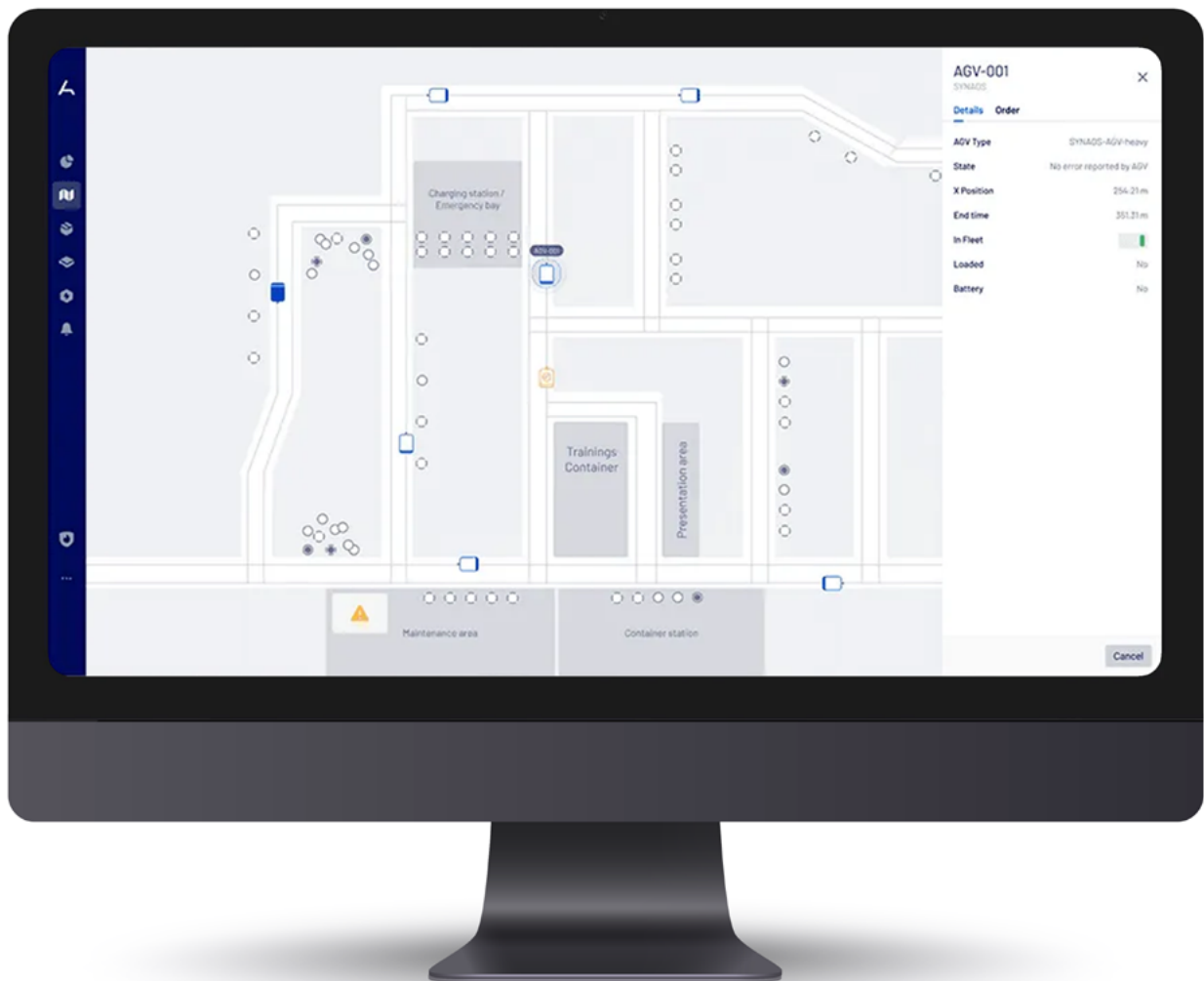
A major trend in intralogistics is mobile robotics. The market for mobile robots is growing rapidly in Europe, the USA, and Asia. At the same time, the number of manually operated intralogistics vehicles produced annually, such as traditional forklifts, is still much higher.

This often results in heterogeneity in the transport processes. The interface standard VDA 5050 is a robust solution for the growing importance of heterogeneous mobile robot fleets and has been adopted in industrial practice. The future will show whether similar standardization initiatives from the USA and Asia will also establish themselves in the market.

Due to the increasing size of mobile robot fleets on one hand, and the growing integration with other IT systems or with shop floor and warehouse assets on the other hand, the requirements and importance of software for coordinating and optimizing intralogistics fleets are rising. Only with a consistent information architecture and the use of data can flexibility and efficiency be achieved.

“ Only with a consistent information architecture and the use of data can flexibility and efficiency be achieved. ”

In a constantly changing intralogistics landscape, advancing digitalization and the combination of performance and reliability of software solutions will play a key role in ensuring flexibility and efficiency in the processes. Since these are often critical operational systems, software solutions for intralogistics should meet the highest standards of stability and security, in combination with comprehensive enterprise support. In conclusion, this is a very exciting environment with great dynamism.



SYNAOS Intralogistics Management Platform

Orchestrate mobile robots, employees and vehicles with industry-leading precision.

Enter a new era of intralogistics: a world in which errors are minimized, processes are intelligently controlled and challenges are mastered proactively. With the support of industry-proven AI technology, SYNAOS equips your processes for the requirements of tomorrow – efficient, future-proof and scalable.

[Learn More](#)

SYNAOS

**PIERRE SKAPSKI**

*Director Practice Operations
& Industry 4.0
TOLSON Consulting*

<https://tolson-consulting.com>



Intralogistics – The Next Revolution in Manufacturing

For more than a decade, whenever we talked about Industry 4.0, it was all about how data optimize production processes and entire business models. Only for the past couple of years have we seen a growing interest in data in the context of intralogistics digitization. Allow me to put it provocatively: the use of data for process optimization is at best a continuation of Six Sigma and other process improvement methods initiated many years ago. Drawing smart conclusions from data flows is not really something new – however, data is a very powerful tool for digging deeper and more thoroughly for valuable insights.

With the optimization of intralogistics, we are now entering a new world where manufacturing companies are attempting to reinvent the organization of their factories. This includes redesigning the shop floor layout, reorganizing processes, and redefining the role of the workforce.

Two factors are essentially driving this restructuring process:

1. The automation of low-value-added tasks, ultimately stemming from the shortage of labor. One of our clients puts this aspect succinctly: “We want our employees to use their brains, not their hands.”
2. The design of agile and versatile processes that can be easily reconfigured to adapt to highly volatile demand.

Companies will consider three dimensions in their search for intralogistics solutions:

1. Automation of intralogistics operations

The market for mobile robotics will continue to evolve. While the focus so far has been on simply transporting goods, new generations of mobile robots can fulfill more specific requirements.

2. Optimization of intralogistics operations

Intralogistics material flow optimizations are evolving from solutions that only experts can operate to universal solutions that support the decision-making process of warehouse personnel. User-friendly interfaces make such solutions accessible to non-experts as well.

3. Development of intralogistics management systems

These systems combine the existing capabilities of current systems and expand them by adding process flow simulation and optimization, as well as real-time integration of production and transport data.

“ Companies are now increasingly recognizing intralogistics as a distinct facet of Industry 4.0. ”

In short, as the factory becomes a mobile factory, there is a need for a platform to monitor these constant movements. This is especially important as the development of mobile robotics will involve the integration of multiple manufacturers since no single robot offers all the functions a company needs. This, in turn, poses challenges in terms of multi-brand management and interoperability. Companies are now increasingly recognizing intralogistics as a distinct facet of Industry 4.0.

Entirely new concepts of factories are emerging that take the crucial step further in optimizing processes and tapping into performance potentials.

**MICHAL UKROPEC**

CEO
Twinzo

<https://www.twinzo.eu>



Digital Twins: “Companies can identify significant Advantages”

Intralogistics and supply chain management were ignored for a long time. Now, they are evolving into a strategic focus. Complex material deliveries and a shortage of personnel raise many questions for all stakeholders. Digital technologies and an agile approach can help in many cases without wasting years on fruitless planning.

The trends that will redefine intralogistics in the coming decade will depend on whether we are talking about new or older facilities. In new facilities, high levels of automation, AGVs, and AMRs will play a significant role. However, in older facilities that have been running for many decades, re-layout and a complete change in production and logistics logic are a challenge. Not just from an ROI perspective but also technically. Can a company afford to halt its entire production for months? In general, automation will be the answer – at least in the western part of the world.

As a provider of 3D visualization technology, Digital Twins are our flagship offering. Here, we consistently observe the same pattern as described above: for new plants or facilities being redesigned facilities, simulations add value and make perfect sense.

“For new plants or facilities being redesigned facilities, simulations add value and make perfect sense.”

However, in the case of ongoing production, real-time analysis can reveal previously invisible aspects, allowing companies to identify significant advantages almost immediately.

On the other hand, standardization can be a much greater challenge for companies than they might anticipate. Companies have numerous providers, suppliers, and legacy systems, making the achievement of a standardized level very complex. Digital twins can help in this regard by bringing different systems under one roof.

To remain resilient and leading in the competitive landscape of intralogistics, companies need to combine an agile mindset with a long-term vision. It's not a good idea to invest millions in overly comprehensive and large strategies right away. Instead, they should test, learn, and adapt.

**JULIAN SEUME**

Director Business Unit PULS Wireless
Wiferion

<https://www.wiferion.com>



One for all: Interoperability and Standardization as a guiding Principle for Future Production Ecosystems

In the upcoming decade, trends like autonomous robots and automated systems that enhance accuracy and efficiency in warehouse management will strongly shape intralogistics. The integration of IoT and advanced data analytics enables real-time monitoring and control of goods flows. The flexibility and adaptability of supply chains are also gaining importance as a response to unforeseen events and demand fluctuations. Especially in the software domain, the use of agnostic solutions is on the rise to establish robust and efficient processes.

As the PULS Wireless Business Unit, we will be able to respond more agilely to new technologies and trends in robotics and intralogistics in the future, for the benefit of our customers. Big data allows us to gain valuable insights from product usage data that can be transformed into new business models and revenue streams. Today, we can already offer proactive maintenance and support services to minimize downtime and increase customer satisfaction and loyalty. Furthermore, processes such as charging strategies and optimized robot configurations can be improved and made more robust on an analytical basis.

“ We are currently witnessing clear trends, such as the use of a unified control software for mobile robots. ”

Future production ecosystems will include highly flexible robots and automation systems, enabling them to quickly adapt to different products and production requirements. Standardized modules and interfaces will be widely used in production systems, making it easier to integrate new technologies and exchange components. We are currently witnessing clear trends, such as the use of a unified control software for mobile robots – and in our case, the shared use of a single charging platform for different mobile vehicles from different manufacturers.

This is what we call interoperability of the charging solution. “One for all” is the guiding principle.

Political rethinking and initiatives will be necessary to maintain the prosperity of Western European society. Unfortunately, due to the often prevailing inertia among decision-makers in politics and German business, this will be a significant challenge. Companies that are both willing to take risks and open to new (technology) partnerships will be particularly successful.

“ Companies that are both willing to take risks and open to new (technology) partnerships will be particularly successful. ”



LUKASZ M. ZIEGLER

*Robotics Evangelist, Founder
we all are Robots*

<https://ziegler.substack.com>



Robotics-as-a-Service democratizes Automation

The advent of Intralogistics 4.0 signifies a profound digital transformation within the realm of logistics, powered by emerging technologies like IoT, AI, and cloud computing. This paradigm shift enables real-time monitoring and control of supply chain processes, offering unprecedented precision and agility.

As the e-commerce landscape continues to surge, the demand for expedited delivery times has escalated. Micro Fulfillment Centers, strategically located in urban hubs, have emerged as a favored solution. Leveraging cutting-edge robotics and AI, these centers orchestrate rapid order processing, enabling same-day or, remarkably, same-hour deliveries. However, these strides in efficiency come hand-in-hand with formidable challenges, particularly in terms of high capital expenditure.

Enter companies like Nomagic, pioneering a transformative Robot-as-a-Service (RaaS) paradigm. This innovative model empowers businesses to adopt state-of-the-art robotic solutions without bearing the burdensome upfront costs. Nomagic's visionary approach democratizes automation, rendering it accessible to enterprises of varying scales.

There are also companies such as Brightpick, which provides robotic solutions for order fulfillment, that offer price per pick or price per tote revenue models. The ability to easily deploy,

reconfigure and scale robotic solutions means companies like Brightpick can offer shorter contract terms and lower upfront costs compared to legacy fixed automation systems.

// The integration of automation and AI-powered robotics is poised to be a hallmark of the industry's evolution. //

The Integration of Automation and AI-Powered Robotics is poised to be a hallmark of the industry's evolution. The digital age, characterized by extensive digitization and the abundance of big data, propels the adoption of robots endowed with cognitive capabilities. These robots transcend the confines of mere efficiency, swiftly adapting to dynamic demands in real-time.

IMPRINT

Imprint

50 Insiders on the Future of Intralogistics
Edition 1
2024

Editor

SYNAOS GmbH
Goseriede 4
D-30159 Hanover

Editor-in-chief: Aymar Pirzada
Project Management: Maël Roth
Editing & Proofreading:
Julian Borchert-al-Huribi, Michael Peters
Design & Art Direction:
MINDACT Consulting & Content GmbH

© 2024 All rights reserved

Reprint only with permission

