



INTRALOGISTIK À LA 4.0

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HOW THE INTERNET OF THINGS, AUGMENTED REALITY AND BLOCKCHAIN APPLICATIONS ARE MAKING THE FLOW OF GOODS VISIBLE, SECURE AND FAST, AND HOW DIGITALISED PROCESSES CAN HELP SUSTAINABLY REDUCE COSTS

At the dawn of the Internet age, innovative marketing was seen as the decisive factor in the battle for market share and profit margins. However, price pressure in international competition has caused growth rates to stagnate. Everyone is now engaging in e-commerce, there is a high level of price transparency online, and customers have become more selective. They want to purchase goods as cheaply and as quickly as possible. Within the course of digitalisation, optimisation of internal processes has therefore gained importance. The magic word of the hour: intralogistics. Smart warehousing tools can be used to accelerate processes and tap into cost potentials. The Internet of Things (IoT), augmented reality and blockchain applications help manage the tremendous flows of data and goods. In addition to software, this also includes rugged, mobile hardware solutions that are just as flexible, fast and dynamic as everyday logistics.

The term intralogistics is old and new at the same time. At the outset, it means nothing other than the organisation, control, implementation and optimisation of material flows within a company. Supply chain is a term commonly used in this context. In the age of big data, however, the analogue flow of goods also includes enormous flows of information. It is important to sensibly link these two flows. For Peter Günther, long-standing chairman of the German Engineering Federation

VDMA, intralogistics therefore aims at „technical solutions for the intelligent transport of goods within a logistics node“. Technical solutions include both industrial trucks and -to an increasing extent- computer systems. Experts predict that, in the future, self-learning machines will network warehouse management and ERP systems so intelligently with each other that consumer behaviour can be predicted and anticipated by evaluating immense amounts of data.

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Artificial intelligence would therefore be used in logistics to take the necessary precautions before a customer even places an order. Digitalisation is forging ahead. At the same time, it is both the cause and the consequence of another mega-trend: acceleration. Digitalised processes are running faster and thus raising expectations, not least among the still growing number of Internet customers. Anyone who is used to buying goods with just one click and receiving the delivery the next day will not forgive any delays. Customer satisfaction is now directly linked to speed. This is a challenge, not least for logistics. After all, the volume of shipments is increasing daily.

According to a survey conducted by the US consulting firm Cushman & Wakefield, the number of parcel deliveries in Europe is expected to increase by a further 69 percent by 2021. „London is the largest and most advanced e-commerce market in Europe in terms of population and purchasing power.“ Great Britain is followed by Germany, Spain and France. Logistics service providers and parcel delivery companies are faced with major challenges, especially in large cities like Munich, Paris and Madrid. Inner-city logistics areas are in short supply and tense traffic situations reduce delivery speeds. This is one of the reasons why in-house processes need to be made faster and more secure.

Klaus-Dieter Rosenbach, Chairman of the VDMA Association for Materials Handling and Intralogistics, states: „We are experiencing a change in the flow of materials and supply chains as a result of growing online commerce and increasingly networked production. These changes can only be mapped and designed using smart intralogistics.“ The data collected by the German Engineering Federation VDMA shows how great the demand for sustainable intralogistics really is. Between 2011 and 2018, German production volume rose from 18 to almost 22 billion Euro. Around 68 percent of the goods produced are sold abroad. This makes Germany the world's most important exporter of materials handling technology and intralogistics, followed by China and the USA.

Especially in Asia and Europe, the demand for innovative industrial trucks is increasing. According to an evaluation by the statistics portal Statista, incoming orders worldwide climbed from 1.4 million systems in 2017 to over 1.5 million in 2018. However, the largest increase was clearly recorded in the „Software and Electrical Automation“ sector. While the production volume in Germany in this area in 2004 was 1.8 billion Euro, by 2017 it had already reached 3.4 billion Euro.

This trend remains unabated. Companies are therefore investing in smart systems that are tailored to the special requirements of logistics. Extremely rugged mobile devices that can reliably process and network large

amounts of data while remaining fail-safe and user-friendly are particularly promising.

Professor Johannes Fottner of the Technical University of Munich is convinced that the use of smart systems for intralogistics is also economically and technically feasible in small and medium-sized companies - even in the area of individualised manufacturing far from mass production. Accordingly, the global market will continue to grow, although Fottner assumes that industrial countries with limited areas and medium to high personnel cost structures - such as Germany - still have a certain lead.



As Chair of Materials Handling Technology, Material Flow Logistics, he researches the prerequisites for successful digitalization of logistics among other things. One key factor is a stringent process-oriented structure with a data technology backbone. „The increasingly flexible automated or semi-automated systems significantly increase competitiveness. In addition to this, they strengthen the ability to respond to market changes, which provides a great opportunity. The prerequisite for this, however, is that the companies implement sustainable processes. Missing processes do not signalise pragmatism or flexibility. Without stringent process orientation, it is impossible to fully tap into the potential of digital instruments.“

Example 1: The Internet of Things visualizes the flow of goods

Modern warehousing has to connect various data sources with each other. However, centrally controlled systems are often too slow. Researchers like Professor Willibald Günthner from the Chair of Materials Handling Technology, Material Flow Logistics at the Technical University of Munich therefore believe in the future of the Internet of Things. In this world, central hubs no longer exist: „Packages, pallets and containers are equipped with a chip that stores both product and transport information. Like the flow of data on the Internet, shipments find their way to their destination themselves. In other words, the package is autonomous!“ In addition to decentralised transport units and materials handling technology modules as well as chips assigned to the containers, software services are used in the Internet of Things to visualise the system.



The example of DHL: The number two on the global logistics market (turnover in 2017: 60.4 billion Euro) maps both the information collected via mobile scanners and transport and loading devices (e.g. forklifts) as well as the data coming from the warehouse management system. All flows of goods can be visualised using a networked tool: It records where each package is located in real time and what the processing status is. This provides for maximum transparency, which accelerates processes and guarantees customer satisfaction. In addition to this, optimal storage locations can be quickly allocated, even

in logistics centres with an area of 40,000 square meters. Heat maps show where many employees are currently working to avoid dangerous situations with loading vehicles, for example. Another advantage: the recorded goods movements can be subsequently analysed. This can be used to determine where discrepancies have occurred or where people and materials have not been utilised in the best possible way. For Tjalling de Vries, Site Development Manager and Innovation Lead at DHL, the advantage of this new intralogistics approach is obvious: “One screen with a clear visualisation of what happens in the warehouse.“ This screen is not only available as part of a large control terminal. Rather, the processes depicted can also be imported on rugged and handy mobile tablets and notebooks that are particularly suitable for logistics.

Example 2: Process restructuring via augmented reality

Industry 4.0 involves more than just process optimisation. Rather, entirely new processes are integrated. This restructuring offers great potential for reducing lead times and costs. However, this requires smart devices that can be used on the go at any time, meet the high demands of intralogistics due to their ruggedness and can be integrated into existing systems without causing interface problems. Augmented reality applications offer interesting possibilities in this regard. In contrast to virtual reality, which creates a completely digital environment, augmented reality adds interactive content such as text, graphics or videos to the real world. One example of this technology is Wikitude. The real environment captured by the user via smart phone - such as Times Square in New York - is supplemented by digital information about nearby sights, restaurants or bus stops. Tablets or smart glasses can also be connected to augmented reality - and offer important support, especially in logistics.

For example, smart glasses can be used to display brief information in the employee's field of vision to help them pack goods by displaying the appropriate carton size or the perfect position in the carton. Data pertaining to the weight and expiry date of the goods can also be displayed on a tablet during visual inspection. The information is retrieved from the Internet or connected databases. Augmented reality can be particularly useful when it comes to order picking. According to a study conducted by logistics professor René de Koster of Erasmus University Rotterdam, 55 to 65 per cent of warehousing costs can be attributed to picking. In addition to this, the work is often carried out by inexperienced assistants. Augmented reality tools can help employees find the right items and the shortest transport routes, e.g. using a pathfinding app. This can be used to reduce picking

errors and increase efficiency. Lightweight, handy, rugged tablets that are equipped with docking stations and powerful rechargeable batteries have proven themselves useful in this regard.

UPS, the world's largest logistics company with locations in more than 220 countries, recently began using virtual reality headsets as part of its driver training program. The company is also looking into the possibilities of using augmented reality to train truck drivers and other employees from the operative business with the help of state-of-the-art technologies in the future. UPS currently operates ten Integrad training centres in the United States and two in Europe, one in Germany (Cologne) and one in the United Kingdom.

Example 3: Blockchain tracking for increased security

One of the most hyped new technologies is actually based on an age-old concept. 35,000 years ago, people were already etching notches in sticks to save and compare data. Maurizio Ferraris, Professor of Theoretical Philosophy at the University of Turin, uses the notch stick to explain how the blockchain works: „Two sticks are laid side by side and notched crosswise, each notch corresponding to a debt. The creditor takes one stick and the debtor takes the other.“ Neither of them can add or remove a notch without the fraud being noticed when comparing the sticks. „The blockchain is nothing more than a worldwide tally stick spread across countless computers.“ It is a record „stored on as many hard disks as possible to prevent adding or deleting records (blocks)“. As such, it serves as a security system. And security is a key aspect of digital processes. After all, who would want the data they share with a project partner via the cloud to be accessed and manipulated by third parties?

UPS has been a member of the Blockchain in Trucking Alliance (BiTA), a group of over 300 companies that is driving the development of blockchain technology, for the past two years. The company is convinced that uniform blockchain standards will strengthen global collaboration and enable UPS customers to tap into international trade and the financial markets. „Blockchain offers a variety of applications in logistics, particularly with regard to the supply chain, insurance, payment, invoice verification and customs,“ says Linda Weakland, UPS Director Enterprise Architecture and Innovation. „The technology has the potential to increase transparency and efficiency - not only for freight and transport companies as well as customs agents, but also for consumers and sellers.“ UPS relies on blockchain applications primarily for customs clearance. Non-transparent and time-

consuming documentation on paper could be simplified by digitalising the processes. The Linde Group plans to use the blockchain in intralogistics to record vehicle maintenance histories. „Blockchain technology enables data to be stored unambiguously and unalterably in the blockchain's data record by way of cryptography when it is passed on,“ says Roger Campbell, Head of Intralogistic Service at Linde. „For this purpose, the corresponding data would first have to be stored in a blockchain. Certified technicians could then add data to the blockchain.



That's the trick: all maintenance operations would be stored in the blockchain in unalterable form. Customers and service technicians would thus be able to trace the entire maintenance history of their vehicle.“ Corresponding procedures are conceivable for the tracking of supply chains or shipments. A consortium led by Kühne + Nagel has already developed a blockchain replacement for the consignment notes that accompany each shipment. Digital stamping is used to ensure each participant can view the location and status of the shipment at any time and at any port in the world. On site, rugged and powerful mobile devices are used for this purpose. The same applies to the aforementioned vehicle maintenance. Especially in workshops, technicians benefit from tablets that are insensitive to dust and shocks, are used throughout the entire shift due to their high battery performance, and can process large amounts of data.

The digital future of the movement of goods has begun - even in medium-sized businesses

Intralogistics 4.0 costs money. Investments in self-learning networked systems tie up capital. But they pay off. Not only the major players in the industry are convinced of this, but also medium-sized companies. Group7, an international logistics company with headquarters in Munich, Germany, is already working on the implementation of various applications, from driver-less transport vehicles to drones in warehouses and blockchain solutions. „We are investing to remain competitive in the future,“ explains Hubert Borghoff, Head of Logistics and Authorised Signatory at Group7. „Our customers are demanding. They expect speed, transparency, flexibility and the greatest possible service from us, which is a particularly strong trend.“



Innovative inventory drone „InventAIRy“ in a Group7 logistics centre. A pilot project for automated inventory in cooperation with doks.innovation and the Fraunhofer Institute.

The last mile determines the quality of delivery today. The recipient wants to be able to rely on the fact that their shipment will arrive at the desired location at the desired time. They want to be able to access both for as long as possible in order to adapt them if necessary. This could be the case, for example, if they have to travel from Munich to Frankfurt at short notice or come home later than expected. „Our task is to prepare the goods in such a way that they meet the customer’s expectations. As such, we can deliver to a hotel, a vacation home or an office between 5 and 6 pm for example. And we schedule times for convenient returns,“ says Borghoff. „The prerequisite for this service is seamless tracking. Real-time information must be retrievable at any time or made available to the customer via e-mail or smart phone app. We use tablets, among other things, to achieve this.“ Group7 also uses augmented reality applications in order picking, for example. Blockchain is a big topic for the future, „but this technology is incredibly complex.

We are currently intensively looking at the areas, in which such applications could be worthwhile.“ There is no question, however, that digital processes hold great advantages, especially for globally active companies. „Tailor-made products and solutions must be developed for each country and for each market. Intelligent, self-learning systems can provide forward-looking solutions, for example when it comes to finding out what the consequences of Brexit are for the supply chain in Great Britain.“ Only those who can handle the tremendous amounts of data and meet the increasing expectations of customers will be sufficiently equipped for the future.

The right equipment is the key to success

Internet of Things, augmented reality, blockchain and self-learning machines - each of these future technologies is based on powerful software and hardware solutions. Especially the mobile devices used in intralogistics have to meet high standards. Employees are under great time pressure and loading/unloading is a hectic task. The mobile devices used must therefore be particularly rugged and often insensitive to dust, shock and water. However, the quality of the housings must not compromise performance and handling. Another decisive factor consists of maintaining the greatest possible flexibility in the processes. Extensively equipped tablets offer complex possibilities in this regard. For example, an integrated camera can make process monitoring much easier when storing goods in your own warehouse or when delivering goods. Damage can be detected and documented at an early stage, and employees can be provided a POD (proof of delivery) in real time. With these security considerations in mind, many logistics companies are equipping their forklifts and trucks with separate cameras - an unnecessary investment when powerful tablets with a high-resolution built-in camera are used.

Due to lower costs, companies are still opting for devices that have a very low or often no ruggedness. Gradually these devices are disappearing from B2B applications, however, due to the high failure rates, associated complications and work interruptions. The administration required for the warranty services for such devices also requires intensive effort and incurs additional costs. Of course, existing equipment has to be kept in order for the work to continue. Getac tablets and notebooks are characterised by their high quality. Some of the models even withstand falls from a height of 1.80 meters without any problems. These have one of the lowest annual failure rates in the entire computer industry. In the unlikely event of failure, however, Getac offers the industry-leading bumper-2-bumper service warranty. This includes worldwide free pick-up, repair and return of the device in just a few days. Even accident damage is covered.



The fully rugged F110 Tablet with 11,6" widescreen-display and sufficient power to run Windows 10 when in action on a forklift.

Another Getac USP is its Truly Demountable Solution. The tablets are not only designed for a single application, such as forklift use, but can also be completely removed and used elsewhere for another task. The high-performance battery supplies the devices with power for hours, thus making it much more efficient than ordinary hand-held devices. The hot-swappable battery also allows for replacement without shutting the device down. Work can therefore be continued without delay.

Rugged mobile terminals - the way to achieve efficient intralogistics

- **Ruggedness:** Rugged tablets are shock- and dust-proof, easy to read even in bright light, and can be used flexibly thanks to various adapter solutions.
- **Ergonomics:** Modern rugged tablets are thin, lightweight and handy to use.
- **Big data:** Mobile devices of the latest generation are capable of processing large amounts of data. They work seamlessly with warehouse management and ERP software.
- **Visualisation of goods flows:** All information from the Internet of Things can be retrieved via tablet, e.g. in the form of heat maps. The displays are high-resolution and large enough to display all important information at a glance. The achieved colour quality is excellent.
- **Battery life:** Efficient, rugged tablets feature high-performance batteries that provide maximum flexibility, especially for outdoor use - even when power is unavailable for many hours. Hot-swappable batteries allow for battery replacement without turning off the power.
- **Reliability:** Rugged computers are four times less likely to fail than consumer devices. The powerful rechargeable batteries easily handle an entire working day.
- **Flexibility:** Sophisticated terminal devices can be used in a variety of ways, whether attached to industrial trucks or for singular use. They include features that facilitate process control, e.g. an integrated camera.
- **Communication:** Data can be exchanged in real time via WLAN, Bluetooth and GPS - a prerequisite for security-relevant blockchain applications.
- **Augmented reality:** Image information is supplemented by helpful data via tablet depending on the situation, e.g. to make it easier for assistants to pick goods.
- **Cost:** Rugged computers can reduce total operating costs by 66 percent over a period of three to five years.