



Logistics Execution in Industry 4.0

Warehouse Management Systems like SAP Extended Warehouse Management (EWM) can play a crucial role in realizing benefits related to Industry 4.0. Deloitte is able to provide guidance on the way to go and together we can get the most out of an implementation of EWM.

What does Industry 4.0 mean?

The first industrial revolution or *Mechanization* started with the invention of the steam engine. This led the way to the second industrial revolution or *Electrification*, with the first usage of conveyor belts in

production environments. The third revolution was *Automation* which brought us to today's modern and networked systems.

Industry 4.0 has arrived and defines the fourth industrial revolution. It stands for a new level of organization and control across the entire value chain during the life cycle of products. The cycle starts at the product idea, extends through development and production, all the way to product delivery to the end customer. The fundament of Industry 4.0 is the availability and usage of all relevant

data in real time by connecting all instances involved in the value chain. These instances can be other IT systems, but also include physical objects like machines and sensors. The ability to extract value added information from a huge amount of data and making astute decisions will become essential for a company's existence.

In the era of Industry 4.0 where markets have become more competitive and customer requirements are more individualized, companies are continuously looking for alternatives

to optimize their warehouse processes, increase warehouse productivity, provide better service levels, reduce costs and thereby boost customer satisfaction. A detailed study on Industry 4.0 in relation to ERP requirements has been conducted in Deloitte's study titled "Industry 4.0: Is your ERP system ready for the digital era?"

Industry 4.0, however, covers a broad spectrum of topics. This point of view paper will focus on the

connected to Warehouse Management Systems (WMSs) too. Examples include the use of Automated Guided Vehicles (AGVs) for warehouse task execution or equipping valuable products or packaging materials with a connection to the internet to enable real time monitoring.

Deloitte use case: AGVs in production supply
Breakthroughs in sensor and imaging technologies have resulted

goods movement information from the WMS. The AGVs can respond to the WMS with goods movement confirmations or information such as blocked storage bins or missing stock.

However, apart from the well-known advantages, such as almost 100% availability, a higher level of safety, and more accuracy, we identified some more important AGV-related value adding opportunities. With the realization of our internal use case where production supply within EWM is executed by AGVs we can show some examples of what is possible.

Opportunities offered by AGVs

Validations

AGVs are fully equipped with a broad variety of sensors. These sensors can be used for validation of weight and dimensions of the handled goods.

Predictive maintenance

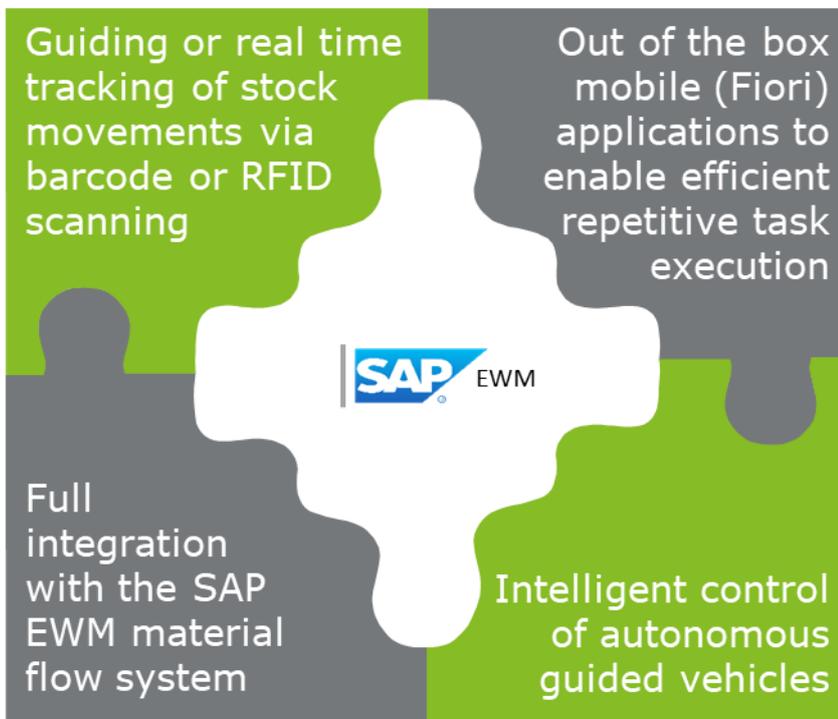
Since the system is logging the number of movements and even weights handled by the machines, predictive maintenance is possible based on historic workload.

Real time optimization of operation

The analysis of bottlenecks in the warehouse via heat map creation provides a basis for optimization of warehouse movement execution. By adjusting the order of tasks upfront waiting times can be avoided.

If all features are implemented, AGVs might be better described as IGVs (Intelligent Guided Vehicles).

Not all data generated by the IGVs of the future will be relevant for the WMS or even ERP system. To avoid data redundancy and unnecessary interfacing effort, it makes sense to apply edge computing. This means that at least a part of the number



advantages related to Industry 4.0 that can be realized by implementing SAP EWM.

SAP EWM offers many opportunities to reimagine your existing logistics execution processes.

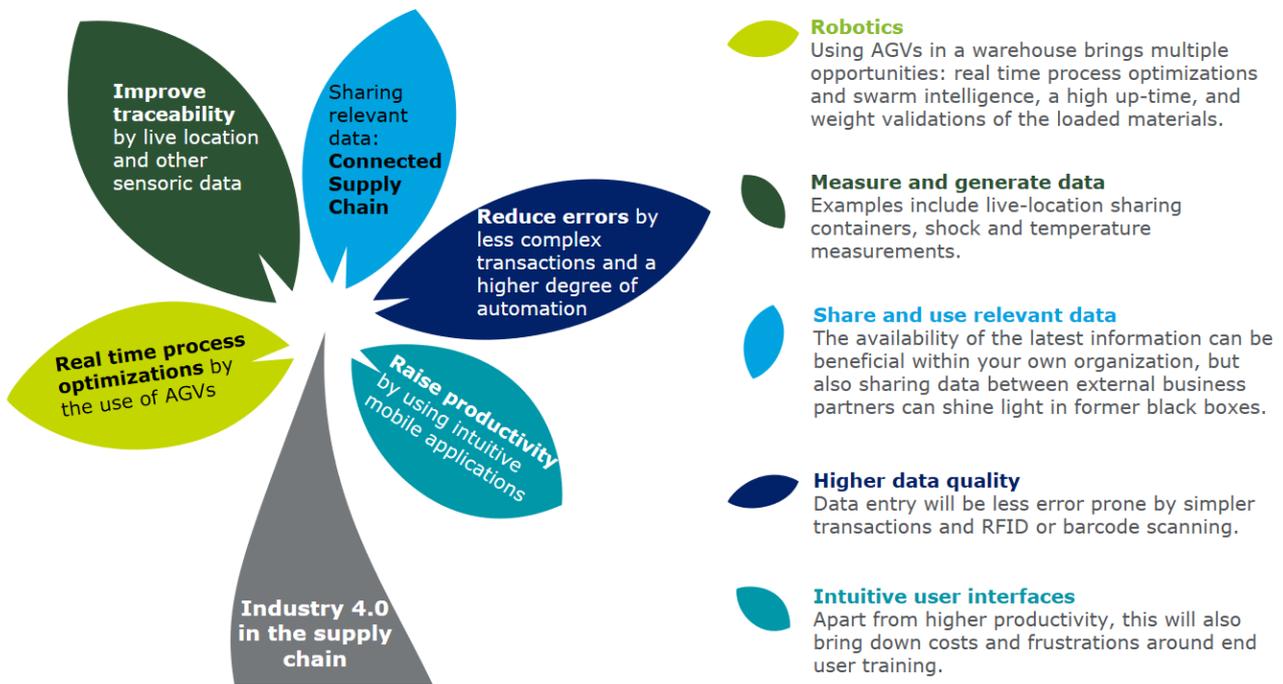
How can SAP EWM help?

Connecting with physical objects

More and more devices are being connected to the internet, contributing to the phenomenon that is well known as the Internet of Things (IoT). Either directly, or via the internet, physical objects can be

in a new generation of self-driving vehicles that are more flexible and reliable than ever before. From autonomous forklifts to driverless trucks, self-driving vehicles will transform logistics and manufacturing lines by attaining new levels of safety, efficiency and quality.

AGVs can work autonomously in warehousing environments if some important prerequisites are fulfilled. These include familiarity with the warehouse lay-out, sensors to observe the live environment and position, and being fed with planned



crunching will not happen centrally, but within or between the members of the network of IGVs.

The type of business is a major factor when considering the introduction of IGVs. Further deciding factors include shipped volumes, and uniformity and maturity of business processes.

Container tracking

The supply chain execution can further be optimized by tracking containers both inside as well as outside the company's premises. This can be done in several ways, depending on the required, relevant data per time interval. Keeping track of valuable returnable packaging materials like temperature controlled containers can be realized by tagging them with RFID labels. Stock levels can also be measured via this contactless identification. In this case, however, hardware has to be installed at all measurement points.

If real-time tracking is needed, following the goods via a device

connected to the internet is an option.

Opportunities when applying IoT to the supply chain

Both AGVs as well as location trackers can be connected seamlessly with SAP EWM via the SAP Cloud Platform, also known as SAP Leonardo. Moreover this platform offers opportunities for mobile application developments, to present generated data in a useful way.

An important consideration will always be the security of the system. The on premise SAP instance and cloud connector, which are part of the enterprise network, are connected to the SAP Cloud Platform via a secure SSL/TLS tunnel. Objects and front-end applications can subsequently be connected to the Cloud Platform. To enable applications to access remote systems, destinations can be created in the SAP Cloud Platform. The segregation of roles is important: an administrator configures the destination in the

SAP Cloud Platform, a developer consumes this destination from the application side.

Coupling data (and using it in a relevant way)

Most products show variations in demand over time. This can be caused by a variety of reasons, such as product maturity or seasonal influences. This demand is widely used for planning purposes as an input for Sales and Operation Planning (S&OP) and to a more detailed extent in Advanced Planning and Optimization (APO). However, this data can also be a useful input for the WMS. The latest demand figures generated by SAP APO can be shared directly and in a standard way with SAP EWM. This potentially dynamic value will be updated within the Warehouse Product Master and serves as an input to the *Slotting and Rearrangement* functionalities in SAP EWM. Dependent on the warehouse lay-out and logistics execution processes these demand figures can be translated during the *Slotting* process into different put

away related indicators via condition records. For example, a product that is expected to have increased shipping volumes in the next period, can already be assigned to an area physically near the staging areas. A step further is to also use *Rearrangement*, a SAP EWM functionality that compares the latest put away indicators with the current stock situation. Imagine that due to an unexpected event the demand of a certain product has risen extremely. In such a case it might be useful to not only influence the future put away location for this product, but also to assure the replenishment of existing stock. These pro-actively planned stock movements are called rearrangements and can be executed during times of low shipping activity. As a result, the average picking time can be reduced significantly.

Human interaction

One other major topic within Industry 4.0 is the interaction between people and systems. Recently, the rapidly accelerating introduction of SAP Fiori applications has emerged as a strong trend. Fiori, SAP's new user experience (UX) software, is a robust solution to build on top of current SAP supply chain and warehousing platforms. These applications can run on a variety of mobile devices that most people are familiar with, such as smartphones and tablets. Typically Fiori applications will have a limited number of functions and therefore can have fewer buttons and sub screens than traditional SAP GUI transactions. Moreover, the use of these function specific applications enables a role-based digital working environment for employees. The Fiori Launchpad acts as the single starting point for all required applications, even if they run on various back-end SAP systems.

Roughly two major groups of applications can be distinguished. One is transactional execution, like the creation of inbound deliveries based on purchase orders, subsequent warehouse task creation, and label printing. The second group consists of operational reports to monitor if all processes are in control. Of course, alerts can be implemented to inform the operator or management when abnormalities occur. These insights can be used to quickly make decisions to, for example, follow up the planning or to mitigate risks. Ultimately, a subset of follow-up actions can be triggered directly from the operational reporting applications.

Opportunities of better human-machine interactions

The digital mindset of employees is important. It has to be clear to everyone, that new technologies coming with the adoption of Industry 4.0, are not replacing, but enhancing their daily work. These insights by co-workers will contribute to a better acceptance and therefore a higher return on investment.

Conclusions and Client Use Case

Above described functionalities and characteristics related to Industry 4.0 are not to be seen independent from each other and are certainly not limited to the warehousing environment only. They should complement and strengthen each other. This all comes together in a Client project that has been recently realized by Deloitte.

Relevant supply chain data such as location and content of supplier trucks are shared constantly with the client's cloud platform. This data is aggregated and interpreted by custom tailored monitoring applications, providing valuable

insights in available stock levels in the near future. Moreover, dock and warehouse resource utilization related to the inbound goods flow can be accurately predicted. Guided by this information planners and warehouse operators can pro-actively anticipate expected peaks and dips, smoothing the sometimes volatile nature of the supply chain.

Our Vision

Deloitte is the only consulting company that actively participated in the early development of the SAP EWM solution. We continued to acquire process and implementation expertise for SAP EWM which is found grounded on successful lighthouse projects across various industries. Together with our clients we are investing in strategic SAP solutions such as embedded EWM on S/4 HANA, SAP Fiori apps and augmented reality solutions to join them in the innovation journey.

SAP EWM Centre of Excellence Service Offerings

Strategy & Process Advisory

Deloitte has deep expertise in warehouse management advisory, process optimizations & design, delivering automation business cases and WMS package selection services.

SAP LE to EWM/TM Migration

Deloitte has a long history of successful implementations in SAP WM and EWM is therefore able to propose a leaner migration and implementation process.

WMS Roadmap

Deloitte has a proven track record in Warehouse Management System roadmap assessment and development.

System Implementation

Deloitte uses a multidisciplinary approach to design, implement and integrate SAP EWM. We offer

implementation services, from Global Template development to localization and solution rollout or a standalone implementations with integrations with ERP, MFS, TMS, CRM or others.

Warehouse Automation

Deloitte designs flexible, lean Distribution Centers, by focusing on business benefits and not just on installing a technology solution. Our knowledge of new trends in warehouse design and equipment offers both challenges and opportunities for state-of-the-art warehouses.

Innovations

Deloitte fosters a culture of innovation and invests in innovative solutions such as embedded EWM on S/4 HANA, SAP Fiori apps and augmented reality solutions (e.g. Pick by Glass, Pick by Voice), Drones, Tablets & Mobile, Automation.

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