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Future of warehouse automation and best approach to integrate with SAP S/4 HANA EWM

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Abstract: This Paper will focus on future of warehouse automation and help (write assist instead- more formal) to adapt the best approach to integrate SAP S/4 HANA EWM for warehouse automation. As Warehouse and Distribution centres (DC) have been battling to meet the growing demands of e-commerce for quite some time. Those demands were already accelerating at a rate of 25%, but the COVID-19 pandemic saw consumer e-commerce sales grow an additional 50%. Currently, more than 80% of warehouse and distribution centres (DCs) operate with a manual workforce and have a shrinking labour pool to choose from. To maximize operational efficiency within this "new normal," DCs will need to consider integrating warehouse automation solutions to make up for labour shortages and increase productivity so warehouse automation will be need of hour to mitigate the risk of supply chain disruption. This paper will also talk about emerging trends and new technologies available in warehouse automation and how we can make supply chain more resilient.

Keywords: Distribution centers (DC), Internet of Thing (IOT), Programmable logic controller (PLC), Handling Unit (HU), Extended Warehouse Management (EWM) , System application and products (SAP), Handling Unit (HU), Control Point (CP), Automated guided vehicle (AGV).

I. INTRODUCTION

Warehouse and distribution centers (DCs) are grappling with a significant and ongoing labor shortage. Increased wages and benefits haven't been enough to reverse the trend. Ever-increasing demand for faster delivery, and ongoing macro supply chain disruption add to the challenge. Warehouse safety issues also remain a problem for recruitment and retention of workers. Warehouse and DC operators are aggressively seeking ways to digitize operations, add automation technology and integrate those technologies with software systems. SAP EWM is a highly standardized and efficient warehouse management software for manual and automated warehouse solutions with material flow functionality that allows the direct connection of PLC-level controls. SAP EWM can integrate with warehouse automation different ways but still people ever wonder what's best approach to integrate SAP EWM with warehouse automation. However, this paper with help to adapt best SAP EWM integration approach with warehouse automation.

Warehouse Automations are going through lot of technology transformation, and there are lots of emerging trends and technologies are available in warehouse automation space such as AGV's, Mobile Robots, Drones, Voice technologies, Augmented reality wearables, etc. Implementation of warehouse automation will help to mitigate the risk supply chain disruption and make the supply chain resilient.

II. FEATURE OF WAREHOUSE AUTOMATION AND ENERGING TREND

Warehouse automation is expected to become an increasingly desirable option to the manual alternative over the next few years. But that doesn't directly indicate a high likelihood of investment in these technologies. However, when asked about the likelihood of warehouse automation investment over the next three years, 60 percent of respondents indicated it was "very likely" while an additional 19 percent considered it "likely" (the remainder chose "somewhat likely" or "not at all likely").

Changes in the operating environment, such as labor costs, labor shortages, and increased throughput requirements; are the primary influential factors for automation being viewed as positive light. Also (in addition), the lower cost and scalability improvement are supporting factors. Below graph show the percentage warehouse automation adoption in next 3 years.
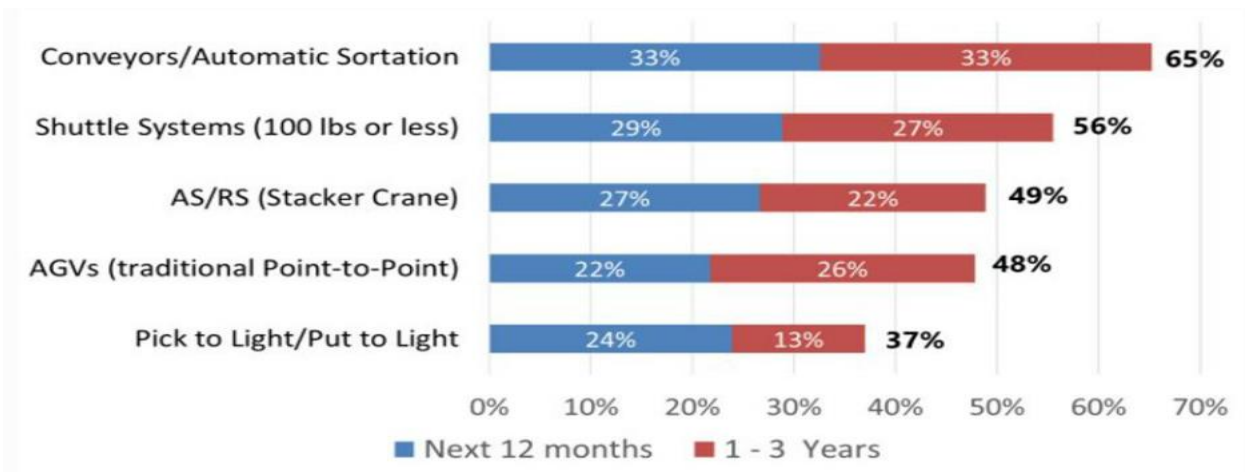

Fig. 1: Established warehouse Automation: Adoption Expectation

Emerging Trend:

Warehouse management plays a vital role in the supply chain, but businesses often overlook simple solutions that can help them stay ahead of the game. As the COVID-19 pandemic and increased international tensions have impacted businesses and countries around the world, supply chains have experienced massive shifts over the past year. To try to keep up, warehouse teams and logistics companies have evolved their processes and leveraged various technology solutions. If business wants to keep up with the pace of change and be able to rapidly adapt to future disruptions, now would be an excellent time to look at warehouse automation. Here are some of the top trends in warehouse automation to inspire your efforts in the coming year.

- **Industrial IOT**:

  If your warehouse systems have not entered the 21st century, it's probably time for an upgrade. Most of today's products (cars, appliances, TVs, phones, factory machines, etc.) are embedded with software, sensors, processing ability, and other technology that connects and exchanges data over the internet or internal communication networks. This is called the Internet of Things.

  On an industrial level, warehouse can enable about everything with IoT to facilitate smart inventory controls, automated picking and packing and even smart lighting solutions for the facility. Having remote access to data and the ability to control systems remotely can improve efficiency and lower overall costs.

- **Automated Machines:**

  Warehouse can use a combination of big data, remote systems, and machine learning to automate things like pallet movers, forklifts, shelving, drones, and local delivery vehicles. Depending on your needs, these systems can operate with or without human input. For example, Amazon uses Kiva robots at the base of its warehouse shelves to make inventory storage, management, and picking easier.

- **Mobile Robots:**

Mobile robots might be the same as automated machines, but they could also be something entirely different. A mobile robot, as it sounds, is one that is not fixed in place. They are designed to move about the warehouse to wherever they are needed. The robots can be autonomous or tied to a fixed path.

Automated mobile robots (AMRs) are becoming popular options because they can integrate quickly into about any warehouse environment without changes to the infrastructure. They can manage functions like packing, packaging, and transportation.

Fig. 2: Mobile Robots

- **Voice Technology:**

Smart technology would be less useful if workers still had to type in instructions or read everything from a screen. Those actions take time, and most people today have become accustomed to using hands-free technology, like Alexa, to order products or a car phone to safely make and answer calls. When applied in a warehouse and combined with the right technology solutions, a worker can speak into a headset microphone to acknowledge instructions for putting away inventory or packaging an order. Workers can use the same technology to interact with warehouse equipment, such as turning lights on and off or troubleshooting a machinery issue.

Fig 3: Voice Technology usage

- **Smart Layouts:**

A huge element of efficiency and safety in a warehouse is its overall design and layout. It can be challenging to amend an existing warehouse, but you'll be glad you made the effort once you realize improved productivity and lower accident rates. Using your vertical space is one solution, but that may not involve automation. Some examples of technology solutions you can use for smarter warehouse layouts include automated shelving and big data. You can take a deep dive into your analytics to see where workers spend most of their time so that you can focus your automation efforts on those areas to improve safety and productivity.

- **Drones:**

Drones might seem kind of trendy, but they have an emerging use in a large warehouse environment. With improved hardware and software innovations and lower equipment prices, drones are an affordable and scalable solution for locating inventory in tough-to-reach places. Drone technology is now also used in shipping and delivery applications. Specifically, it is used for barcode and RFID scanning, inspecting stocks, and retrieving goods.

Fig.4 : Wahreouse Drones

- **Augmented reality wearables:**

  Rather than replace all your workers with robots, you can better equip them to do their jobs more efficiently. They will take fewer steps for every task and be placed in fewer dangerous situations. Combined with RFID tags and mobile warehouse management systems, employees can be outfitted with wearable technology like armbands, headsets, or eyeglasses (think Google Glass) to complete tasks. Using this type of hands-free technology, a worker has access to turn-by-turn instructions for picking, packaging, and storing products. Once a task is complete, it is automatically recorded in the system, and the worker is assigned the next task on the list.

- **Sustainability and Renewable Energy:**

  All warehouse automation solutions require leveraging technology, which involves investment and operational costs. Warehouses already use a lot of energy, but(however) many businesses are trying to improve sustainability and reduce their environmental impact by using renewable energy systems. Amazon, Target, Kohl's, and some other big-box retailers are already leading the way by using wind turbines and solar panels to offset power consumption in large facilities. This can help (assist to) reduce costs for a large and busy operation.

III. BEST APPROACH TO INTIGRATE SAP EWM WITH WAREHOUSE AUTOMATION

Today's world gets more complex and connected at the same time. Be it global supply chains or – most recently – challenges due to disruptions caused by COVID-19. Uncertainty is a given. Thus, supply chains and their warehouses must react. Warehouse automation can be one measure to gain flexibility and mitigate the risk of supply chain disruption and make the supply chain more resilient. People ever wondered how to integrate SAP EWM to warehouse automation. In principle there are two ways:

1) **SAP EWM-MFS:**

   The material flow system (MFS) enables you to connect an automatic warehouse to Extended Warehouse Management (EWM) without the need for an additional warehouse control unit. MFS can be set up in such a way that warehouse tasks from an identification point to a storage bin in an automatic high-rack storage area are subdivided into smaller tasks. These are passed on step by step to the programmable logic controller (PLC) responsible in each case using telegram communication. The put away and removal from storage of handling units (HUs) can thus take place without the use of:
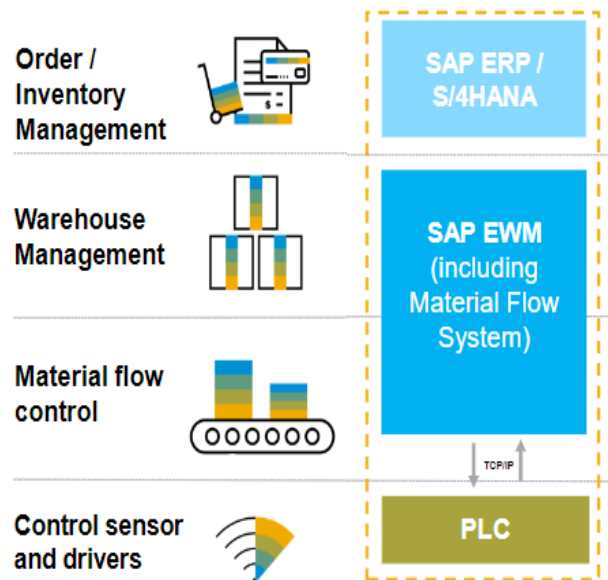
Fig. 5: Logical Layers in automated warehouses

With the built-in component SAP EWM MFS, automated material handling equipment (MHE) of warehouses can be connected to and can be conducted by SAP EWM. To achieve this, information must be exchanged between SAP EWM and the control systems of the automated material handling equipment's. Below Figure shows how the information exchange between material handling equipment's and EWM through PLC.
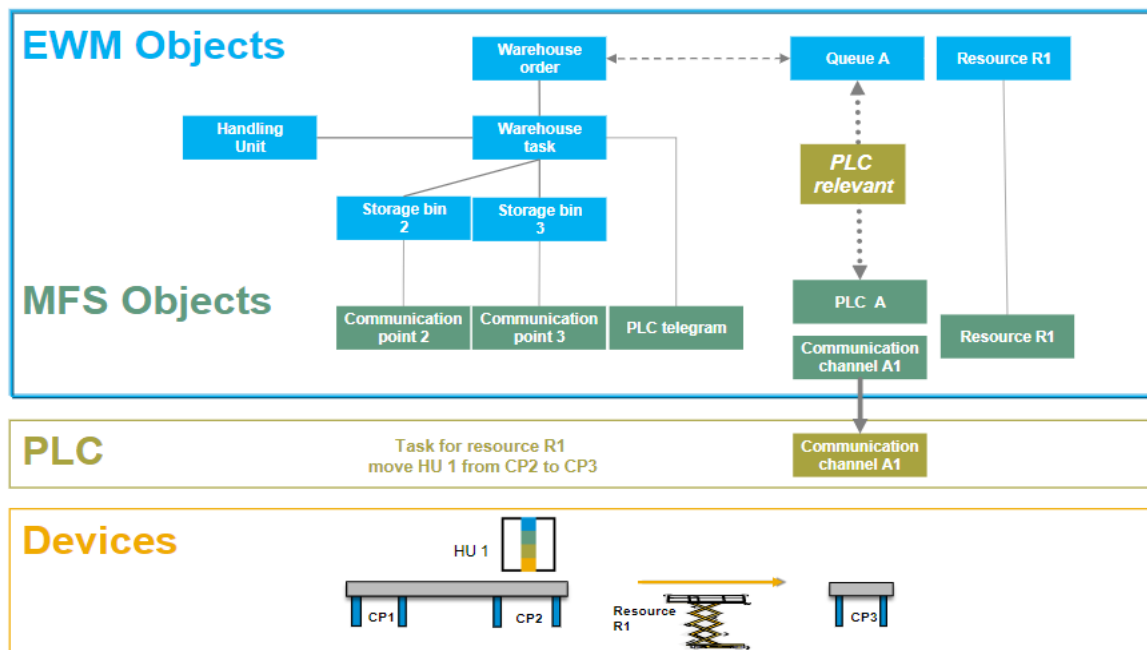

Fig. 6: Integrated MFS with EWM

Following are some of the types of material handling equipment's that can be integrated through SAP EWM MFS:

- **Conveyers:**

  o Pallets /Cases/Packages

  o Transfer cars Sorters

  o Label Applicators

  o Pick, Pack and pass picking principle

- **Storage retrieval machines:**
  - Automated storage and retrieval system (ASRS) pallets / cases
  - Goods-to-Person picking principle
  - Shuttle warehouses

- **Subsystems:**
  - Monorail system
  - Automated guided vehicle systems (AGV)

As mentioned above, MFS is embedded object inside the SAP EWM because of this it gives benefit to customer in many ways. Some of the benefits are as below:

- Direct Connection to PLC. No third-party software required.
- Control of any kind of automation without external Material Flow System
- Higher transparency on processes.
- Scalable Architecture
- ONE responsibility for warehouse management and material flow control
- Only SAP knowledge necessary
- Only one SAP System landscape necessary
- Central monitoring of WMS and MFS

2) **SAP EWM-WCU:**

This method is conventional, and it is known from SAP LE WM time. In this method, EWM takes on all tasks related to warehouse management. However, warehouse control and execution of driving commands are not part of EWM's tasks. For this reason, the non-SAP systems always represent standalone systems for the SAP system, which can take on control of the product flow, as well as other tasks such as optimizing the stock movements or additional control mechanisms. It will be using mostly standard SAP IDOC types of WCU interface. So, implementation is also not complex. However, monitoring and control is not well integrated.

In fully automatic warehouses, EWM takes on the most important tasks of warehouse management:

- Managing the product stocks
- Managing storage bins
- Triggering warehouse movements (stock removal, put away, stock transfers and posting changes)
- Carrying out the inventory
- Determining the storage bins for warehouse movements based on fixed put away and stock removal strategies
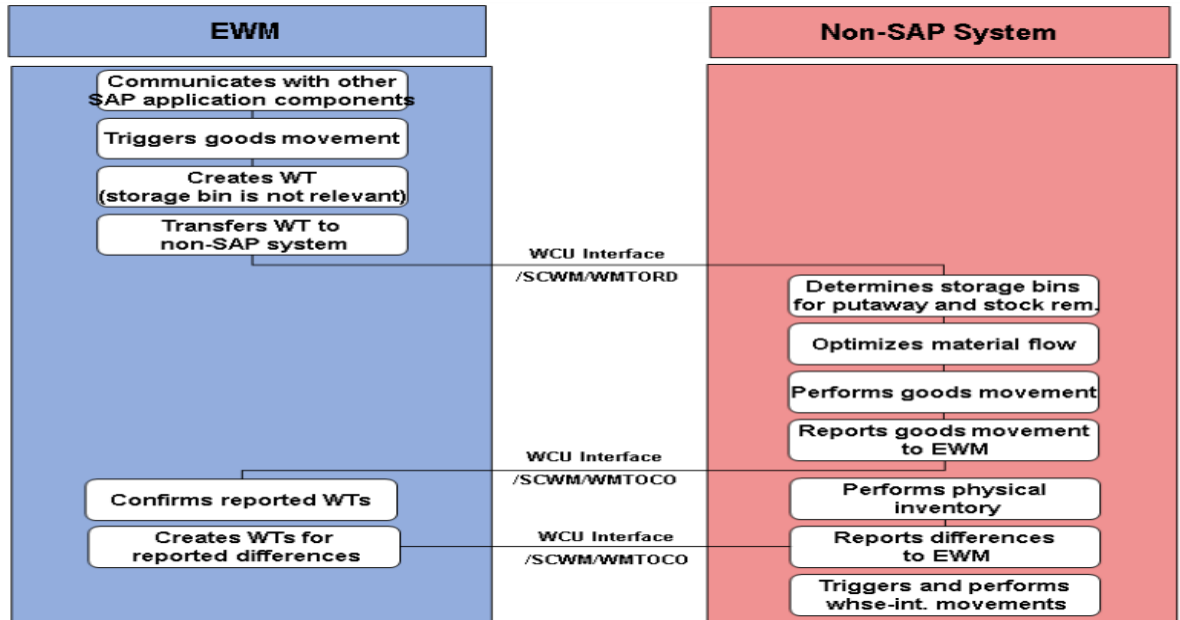
Fig. 7: EWM and Non-SAP system integration through WCU interface

The external system (non-SAP) takes over the entire warehouse controlling:

- Controlling the conveyor equipment

- Controlling the product flow

- Optimizing resources

Benefits of SAP EWM -WCU:

- This method can be use without disturbing the current set while migrating from WM to EWM.

- Its faster and simple to connect with external FMS system as it uses conventional IDOC system.

- Less implementation effort.

III. SAP EWM-WCU Vs SAP EWM MFS:

Below figure help you to decide the which approach/method is best to integrate SAP EWM with warehouse automation
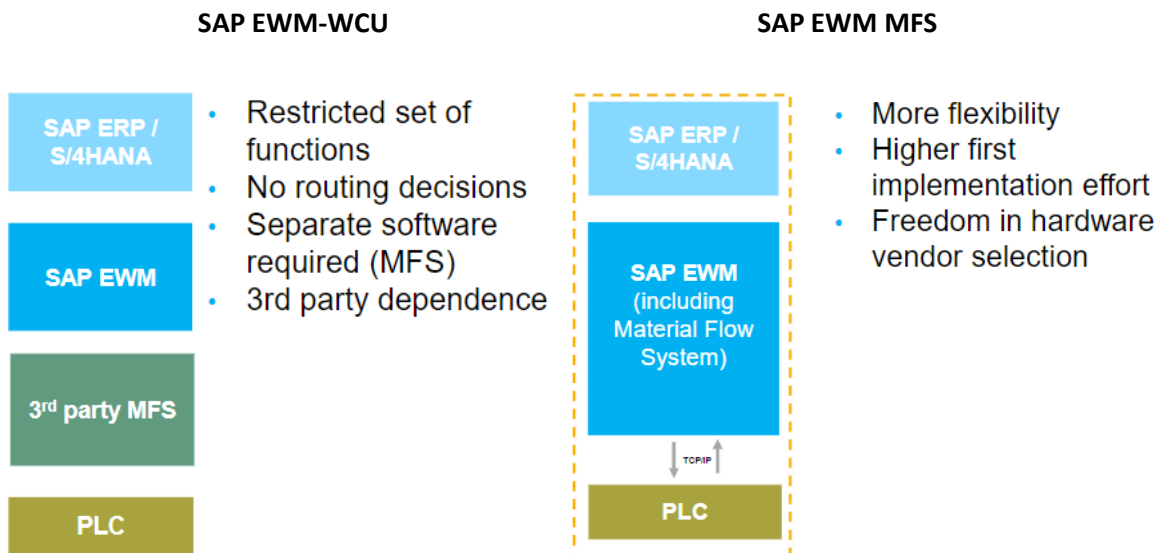

Fig. 8: SAP EWM-WCU Vs SAP EWM MFS

IV. CONCLUSION

Last 5-10 years, as more people are making purchases online, we have seen a dramatic increase in goods needing to get to places faster, more accurately, and in better condition. Most consumers want products that not only arrive in a timely manner but expect little to no hassle in receiving the products. This has put massive pressure on the warehouse industry to find new ways of sorting, packing, storing, and sending out goods that come into the warehouse in a more efficient way without any mistakes or issues arising. Also, supply chain process become more global and most recent challenges due to disruption caused by COVID-19 make the supply chain process almost collapsed. Hence to mitigate the risk of supply chain disruption, warehouses need to adapt the modern technologies in warehouse automation such as AGV's, Warehouse drones, Mobile robots, IOT, Voice Technology, etc. which further need to integrate with warehouse management software. SAP EWM is the best warehouse management software solution as SAP EWM has its excellent integration in today's SAP world and its ability to leverage existing SAP expertise and associated tools such as SAP Business Warehouse (SAP BW) to analyze large volumes of data in order to obtain meaningful information for sound decisions. As mentioned above there are two ways to integrate SAP EWM with warehouse automation, SAP EWM MFS has more advantages over the SAP EWM-WCU because it has more flexibility, freedom in hardware selection, Scalable Architecture, and more control over processes. Hence would recommend adapting the SAP EWM MFS approach for integration with warehouse automation.

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Manish Bhagwat, received the B.E degree in production Engineering in 1997 from Amravati University and M.M.S degrees in Computer Management from Pune University in 2004. Since 1997 he is working in various IT industries as SAP supply chain expert. Currently he is in United States working for Cognizant as Global Supply chain leader. He traveled many countries across Globe and implemented Supply chain solution in many industries.