



Achieving End-to-End Supply Chain Visibility: Integrating SAP EWM with TM

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Abstract In today's complex and dynamic business environment, achieving end-to-end supply chain visibility is paramount for organizations seeking to optimize their operations and enhance customer satisfaction. This paper explores the integration of SAP Extended Warehouse Management (EWM) with Transportation Management (TM) to achieve comprehensive visibility across the supply chain. By seamlessly connecting warehouse operations with transportation planning and execution, organizations can streamline processes, improve efficiency, and respond effectively to changing market demands.

Keywords Supply Chain Visibility, SAP EWM, SAP TM, Integration, Warehouse Management, Transportation Management.

1. Introduction

Supply chain visibility has emerged as a critical factor in driving operational excellence and maintaining a competitive edge in the global marketplace. With the proliferation of digital technologies and the increasing complexity of supply chain networks, organizations are facing challenges in gaining real-time insights into their supply chain processes. This paper focuses on the integration of SAP Extended Warehouse Management (EWM) and Transportation Management (TM) to overcome these challenges and achieve end-to-end visibility.

Overview of SAP EWM and TM:

SAP Extended Warehouse Management (EWM) is a comprehensive solution for managing warehouse operations, including inbound and outbound processes, inventory management, and resource optimization. It provides advanced features such as slotting optimization, labor management, and wave management to improve warehouse efficiency and flexibility.

SAP Transportation Management (TM) is a robust solution for planning, optimizing, and executing transportation activities across the supply chain. It enables organizations to manage transportation orders, carrier selection, freight cost calculation, and track shipments in real-time.

TM (Transportation Management) serves as a strategic platform for orchestrating transportation planning and execution, seamlessly intertwined with SAP's ERP infrastructure. EWM (Extended Warehouse Management), on the other hand, operates as a sophisticated Warehouse Management System (WMS), intricately linked with SAP's ERP system. When utilized in tandem, EWM and TM offer an all-encompassing approach to streamline and enhance warehouse and transportation operations within a company. This synergy enables coordinated planning and execution of inbound and outbound shipments, efficient inventory management, streamlined warehouse processes, and the optimization of transportation routes and expenses.

SAP EWM has the capability to seamlessly integrate with SAP Transportation Management (TM), offering a comprehensive solution for end-to-end supply chain management and logistics. Integration between SAP TM and SAP Extended Warehouse Management is facilitated through both inbound and outbound interfaces. The



inbound interface enables the transfer of essential data, such as shipment details and transportation requests, from TM to EWM. Conversely, the outbound interface facilitates the transmission of critical information, including shipment statuses and delivery confirmations, from EWM to TM.

Moreover, integration between these systems can be further enhanced using the SAP Event Management (SAP EM) application. SAP EM enables the exchange of key events, such as shipment status updates, delivery confirmations, and error notifications, between SAP TM and SAP EWM.

For a more centralized and collaborative approach, businesses can leverage the SAP Supply Chain Collaboration Hub (SAP SCCH) to integrate SAP TM and SAP EWM. This platform serves as a centralized hub for suppliers, customers, and logistics service providers to collaborate and share data seamlessly. By incorporating data from both TM and EWM, the SCCH promotes more efficient collaboration and communication across the supply chain.

2. Literature

A. SAP EWM vs SAP TM: [NA]

Remaining at the forefront of the supply chain, SAP solutions wield significant influence over supply chain management. SAP Transportation Management (TM), as part of SAP's Supply Chain Execution Platform, standardizes the utilization of fields for container and vehicle resources across forwarding and freight documents. This standardization ensures consistent data transfer to subsequent documents, a critical aspect for large enterprises. SAP TM facilitates end-to-end collaboration among carriers/subcontractors, logistics service providers, shippers, and customers, offering comprehensive value across various scenarios, including direct truck shipment, multi-modal domestic shipment, airfreight, and ocean shipments. The system creates freight units based on scheduled line items of order-based transportation requirements, with options for manual or automatic creation. Key responsibilities of SAP TM include providing customizable templates for calculation sheets and rate tables, dynamically generating optimized routing proposals, displaying a harmonized user interface, determining distances and durations, optimizing resource utilization, and handling large data volumes through automated planning processes.

Similarly, SAP Extended Warehouse Management (EWM), also part of SAP Supply Chain Management, offers advanced features for warehouse activities. It is a preferred choice for robust IT strategies. SAP EWM oversees warehouse control activities such as picking, posting, storage bin management, and receipt checks.

It optimizes storage concepts through slotting and automated arrangement, manages hazardous substances in compliance with regulations, provides interactive reporting on various warehouse operations, and ensures seamless connectivity with multiple ERP systems without loss of capacity.

Difference between SAP TM and SAP EWM: While SAP TM focuses on reducing freight costs through resource capacity optimization, SAP EWM enhances warehouse efficiencies. SAP EWM encompasses warehouse management features like picking, shipment, radio frequency mobile data entry (RF framework), warehouse structure, and flexible options. Conversely, SAP TM prioritizes transportation planning, optimization, freight tendering, and charge management. SAP offers direct integration between SAP TM and SAP EWM, allowing businesses to choose based on their specific requirements and platform capabilities, thereby ensuring efficiency tailored to their needs.

Key Differences:



B. Integration Architecture:

In the realm of SAP S/4HANA, SAP Transportation Management and SAP Extended Warehouse Management stand as robust solutions for overseeing transportation and warehouse processes. To fully capitalize on the potential within your digital supply chain, it's imperative to integrate both solutions seamlessly. The integration between TM and EWM allows for flexible design of warehouse processes, whether conducted before or after transportation planning.

SAP provides two primary modes of integration:

1. Integration based on EWM Transportation Units: This method involves integration via Interface Mapping of freight orders as Transportation units in EWM.

2. Advanced Shipping and Receiving: Representing the new strategic architecture for SAP logistics, this approach facilitates direct integration with freight orders as central business documents.



The Advanced Shipping and Receiving Integration signifies a pivotal advancement in SAP's logistics landscape, promising enhanced efficiency and effectiveness in supply chain operations.

With SAP TM-EWM Embedded in S/4HANA, SAP now facilitates direct integration between SAP TM and EWM. The Packages Building functionality within Transportation Management empowers users to construct pallets or handling units (HUs) utilizing the most suitable packaging materials, thereby optimizing truck capacity. This direct integration streamlines the transfer of packaging material data from TM to EWM. Consequently, the warehouse manager can efficiently arrange for the packing of deliveries using the same packaging materials, overseeing the entire process from picking to loading and dispatching goods to customers [1].

In the integrated S/4HANA environment, core business documents such as Sales Orders, Deliveries, or Purchase Orders trigger the creation of Transportation Requests, which are converted into Freight Units within SAP TM. Transport planners utilize the Transportation Cockpit to compile planning activities, resulting in the creation of Freight Orders or Freight Bookings. Upon finalizing the load plan or upon receiving loading instructions, the planner updates the status of the Freight Order or Freight Booking to "Load plan finalized" and transmits relevant instructions to SAP EWM [1].

EWM, upon receiving the trigger from TM along with necessary details, generates Transportation Units for picking, loading, and goods issuance to the customer. This integrated workflow ensures seamless coordination between transportation planning and warehouse operations, enhancing overall efficiency and customer satisfaction [1].

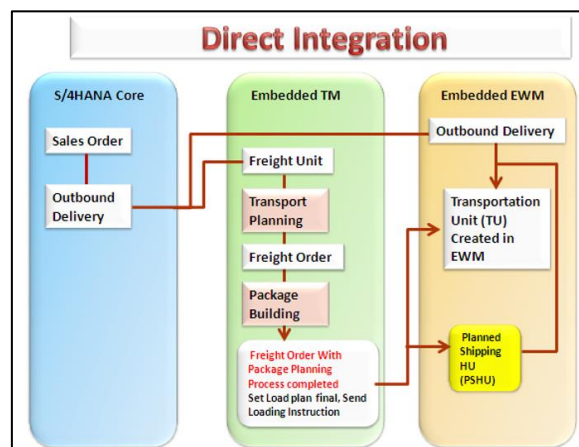


Figure 1: Direct Integration [1]



For SAP S/4HANA implementations incorporating EWM and TM, it's crucial to establish a specific setup to enable the seamless execution of end-to-end processes, encompassing sales orders, deliveries, freight units, freight orders, transportation units, picking, packing, and goods issuance. The following step-by-step guide outlines the critical steps necessary to facilitate the integration between freight orders and transportation units. The below 12 steps summarize what needs to be done [2]:

Step	Title	TC
1	Assign warehouse and logical system to location (TM Tab)	/SCMTMS/LOC3
2	Assign packaging material to to TM means of transport	/n/SCWM/PM_MTR
3	Activate messages in PPF	SPFFC
4	Un-assign scheduling conditions in PPF	SPFFC
5	Create Ewm integration profile and assign to Fo type (+ assign output profile for ppf.msg)	SPRO -> TM -> Integration -> Define EWM Int Profile
6	Configure carrier (has to have partner roles Carrier and Supplier)	BP
7	Make sure Fo has a carrier and a resource with MTR which has packing material assigned and press load plan status finalized.	Edit Road freight order (search in S4 Fiori)
8	Configure xmi messaging service and check messages	SRT_MONI
9	This is how the Fo execution tab has to look like after „Tu generation“	Edit Road freight order (search in S4 Fiori)
10	Check Tu was generated in (set default values with warehouse and large assign start date + end date. Exit Tu number = FO Number)	/SCWM/TU, Database table /SCWM/TUNIT
11	This is how the Fo execution tab has to look like after „arrival at checkpoint“	Edit Road freight order (search in S4 Fiori)
12	This is how the Fo execution tab has to look like after „load complete“	Edit Road freight order (search in S4 Fiori)

Figure 2 [2]

In the S/4HANA 1909 system, the integration between TM and EWM in the outbound delivery process operates seamlessly, ensuring efficient coordination between transportation planning and warehouse operations. Let's examine and exemplify the key steps involved in TM and EWM integration [3]:

TM Side [3]:

Planning for Outbound Deliveries: In the TM module, outbound deliveries are planned based on sales orders or outbound delivery requests.

Packaging: Packaging units are determined for the outbound deliveries, considering factors such as product dimensions, weight, and stacking requirements.

Determining the Loading Sequence: TM determines the loading sequence for the packages based on factors like delivery priority, delivery window, and vehicle capacity.

EWM Side [3]:

Automatic Creation of Transport Unit (TU) with TM Integration: Upon receiving integration signals from TM, EWM automatically creates transport units to organize and manage the goods for shipment.

Creation of Planned Transport Handling Units (THUs) with TM Reference: EWM generates planned transport handling units, referencing the data provided by TM, to facilitate efficient warehouse operations.

Using Planned Shipping Handling Units (PSHUs) as Reference: Warehouse orders are created in EWM, using PSHUs as a reference, to guide the picking and packing processes.

Operation of Collection Steps in the Warehouse: EWM executes collection steps in the warehouse, utilizing the PICK-HUs generated based on the PSHU references.

Yard Management Activities: Movement of transport units within the yard is managed using EWM's Yard Management functionality, ensuring smooth transition between warehouse and transportation areas.

Loading of Handling Units into Vehicle: The HUs collected in the warehouse are loaded into the vehicle according to the loading sequence determined by TM.

ERP – Transportation Management (TM) Side Process Steps [3]:

Create Sales Order & Outbound Delivery:

Sales orders and outbound deliveries are created in the ERP system, triggering the creation of freight units for TM planning.

Plan Freight Units with TM:

TM plans the freight units based on the sales order and delivery data, considering transportation constraints and optimization algorithms.

Create Packaging Units and Loading Sequence:



Packaging units are defined, and loading sequences are determined within TM to ensure efficient loading of goods onto vehicles.

Send Loading Instructions to EWM:

Loading instructions, including packaging, and loading details, are transmitted from TM to EWM to guide warehouse operations.

After the loading instruction is sent, EWM proceeds with the following process steps.

Extended Warehouse Management (EWM) Side Process Steps [3]:

Check the Transport Unit Created in EWM:

EWM verifies the creation of transport units based on the integration signals received from TM.

Check the Planned Shipping Handling Units (PSHUs) Created from TM:

EWM confirms the creation of planned shipping handling units referenced from TM.

Create Warehouse Order Referring to PSHUs:

Warehouse orders are generated in EWM, referencing the PSHUs, to initiate the picking and packing processes.

Pick Warehouse Order with Pick-HUs:

EWM executes the picking process, selecting the appropriate handling units for each warehouse order.

Check Handling Units and PSHUs:

EWM verifies the integrity of handling units and planned shipping handling units to ensure accurate picking and packing.

Yard Activities for Handling Units:

Yard management activities are performed to manage the movement and staging of handling units within the warehouse premises.

Loading Referring to TM Load Sequence:

The loading process in EWM follows the loading sequence determined by TM to optimize the utilization of vehicle capacity.

Goods Issue:

Goods are issued from the warehouse in EWM, indicating the completion of the outbound delivery process.

Yard Activities for Handling Units:

Finally, yard management activities are conducted to coordinate the movement of handling units within the yard area.

For error checking and monitoring, the following transaction codes can be used [3]:

SRT_MONI: EWM side log control

SBGRFCMON: TM side inbound and outbound log control

SLG1: User-based application log

SMQ1: Outbound queue

SMQ2: Inbound queue

These transaction codes enable users to review logs and monitor the integration process for any errors or issues that may arise.

C. Benefits of EWM - TM Integration:

Enhanced Transportation Planning:

Integration between EWM and TM enables more effective transportation planning by considering warehouse-specific constraints such as storage capacity and inventory levels. This optimization ensures efficient utilization of transportation resources and minimizes costs.

Improved Inventory Management:

The integration of EWM and TM facilitates real-time tracking of inventory and transportation activities. This visibility ensures that inventory levels are accurately monitored and maintained, leading to improved stock availability and reduced stockouts.

Increased Automation:

Integrating EWM and TM allows for the automation of various transportation processes, including carrier selection, shipment planning, and freight billing. Automation reduces manual intervention, streamlines operations, and enhances overall efficiency in transportation management.



Better Compliance and Risk Management:

By integrating EWM and TM, companies can centralize transportation-related data, enabling better compliance with regulations and more effective risk management. A single source of truth for transportation data ensures accuracy and transparency, reducing the likelihood of compliance issues and operational risks.

Improved Customer Service:

Integration between EWM and TM enables companies to provide real-time tracking information to customers. This enhanced visibility into transportation and logistics processes allows for proactive communication with customers and facilitates more informed decision-making, ultimately leading to improved customer satisfaction.

D. Considerations in SAP TM and SAP EWM Integration:**Data Exchange Volume:**

Integrating EWM and TM involves exchanging a significant amount of data between the two systems. Both EWM and TM maintain their own sets of master data (e.g., material and location master data) and transactional data (e.g., delivery and transfer order data). Managing this data exchange efficiently is crucial to prevent system strain, slow performance, or data inconsistencies. Proper data synchronization mechanisms must be in place to ensure seamless integration without compromising system resources.

Integration Complexity:

The complexity of integrating EWM and TM can pose a significant challenge. Both systems are intricate and feature-rich, with their own unique functionalities and processes. Integrating them requires thorough understanding and customization to align their workflows and data structures. This complexity can lead to increased implementation time and costs if not managed effectively. It is essential to have a detailed integration plan in place and conduct thorough testing to identify and address any potential issues before deployment. This helps mitigate the risk of bottlenecks and ensures the smooth operation of the integrated solution.

3. Use Case**Imperial Logistics' SAP TM and SAP EWM Integration [4]**

Imperial Logistics, a global logistics provider headquartered in Duisburg, Germany, with over 30,000 employees across 340 locations, faced a significant challenge due to the complexity of its data processing infrastructure resulting from multiple acquisitions. With divisions in transportation and supply chain services, the need to standardize the heterogeneous landscape became paramount.

Challenge:

The continuous growth and complexity of the data processing infrastructure, stemming from various company acquisitions, posed a significant challenge for Imperial Logistics. Standardizing this landscape was imperative. In 2015, the company embarked on rebuilding its IT network, with SAP S/4HANA playing a crucial role as a strategic partner. The roadmap focused on finance and logistics areas, with the German and Chinese entities adopting SAP S/4HANA Finance on Release 1511 in mid-2016.

Solution:

Amidst a corporate restructuring in early 2016, two divisions were established: Imperial Transport Solutions and Imperial Supply Chain Solutions. However, the Transport Division lacked any SAP application. To address this, a logistics template was implemented for the Chemicals division, primarily covering warehouse and transport logistics. SAP EWM and SAP TM were recommended as partial solutions for managing and optimizing the digital supply chain. The introduction of Embedded EWM and subsequent TM integration into the overall S/4HANA solution, starting from releases 1610 and 1709, marked significant milestones.

Result:

The pilot implementation of the logistics template laid a solid foundation for further digitization and harmonization of the IT structure at Imperial Logistics. By adopting Embedded SAP S/4HANA EWM and TM processes, the connection between warehouse and transport operations was significantly enhanced. This integration facilitated seamless coordination and optimization of logistics processes, marking Imperial Logistics as a pioneer in leveraging new software solutions for improved efficiency and competitiveness.



4. Conclusion

In today's dynamic business landscape, achieving end-to-end supply chain visibility is paramount for organizations striving to stay competitive and responsive to market demands. The integration of SAP Extended Warehouse Management (EWM) with Transportation Management (TM) offers a robust solution to address this imperative.

Through seamless integration, organizations can unlock a myriad of benefits, ranging from enhanced transportation planning to improved inventory management and increased automation. By leveraging the capabilities of SAP EWM and TM, companies can optimize their logistics processes, streamline operations, and improve customer service.

The case of Imperial Logistics exemplifies the transformative impact of integrating SAP EWM with TM. By standardizing their heterogeneous landscape and implementing Embedded EWM and TM processes within SAP S/4HANA, Imperial Logistics achieved significant milestones in digitizing and harmonizing their IT infrastructure. This not only laid a solid foundation for further innovation but also resulted in sustainable improvements in warehouse and transport processes.

In conclusion, the integration of SAP EWM with TM represents a strategic investment for organizations looking to enhance their supply chain visibility and agility. By leveraging the power of SAP's comprehensive solutions, companies can navigate the complexities of modern supply chains with confidence, driving profitability, and customer satisfaction.

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