

White paper

WM versus EWM:

Receiving and Putaway + Picking and Goods Issue

The luxury of the choice

Since 2006 SAP has enriched its SCM (supply chain management) portfolio with a new warehouse management solution, called Extended Warehouse Management (EWM). EWM offers increased flexibility and capabilities beyond the existing ERP WM solution, part of SAP's ECC (Enterprise Central Component) solution. SAP does not see EWM as a replacement of the ERP WM solution, but as a more powerful alternative. Up to you to make the choice (based on your specific requirements)...

The question now arises which solution best fits the current and future needs of your warehouse. This SAPSTROOM paper is covering the similarities and differences between ERP WM and EWM. It is not the aim to give a full technical description of the processes, nor a complete overview of all the differences and possibilities. We try to balance between making an understandable paper and providing an overview. A management summary lists some of the differences .

These papers address several groups of people:

- * The WM specialists: parts of this paper assume some ERP WM knowledge. Similarities and differences between ERP WM and EWM will be explained, and the new terminology of EWM will be addressed.
- * The Logistics and IT manager, who needs to take the tough decisions and choose between one of the two systems. An "Evaluation Tool", complementary to this document, addresses the questions to ask, calculates a score and helps to choose the right solution.

A word on TRM (Task and Resource Management): TRM was introduced by SAP in 2002 as an extension to ERP WM. We do not include an extensive elaboration of TRM in order not to complicate the picture. SAP has indicated not to continue new developments on TRM. EWM is there to take the place of TRM.

Evaluation tool

The decision between WM and EWM can be difficult. SAPSTROOM is working on an Evaluation Tool with a series of relevant questions to be asked. Part of this tool is a scoring system with an Excel sheet. Your input is used to calculate an overall score for ERP WM and EWM. If the difference is significant, there is a good indication in either direction.

The Evaluation Tool is now available and free. Just send an email to admin@sapstroom.com

About us

SAPSTROOM is a Belgian company focusing on SAP Logistics Execution. This covers mainly the modules Warehouse Management (WM), Transport, Global Trade Service (GTS) and Extended Warehouse Management (EWM).

Besides executing logistics projects, SAPSTROOM is a valued partner of SAP Belux Education where the SAPSTROOM experts teach most logistic training courses.

The Inbound process in different Business scenarios

Receiving and Putaway constitute the two major sub-processes of the inbound process. Good practice dictates to be pro-active when receiving. This implies:

- * Receive against a reference document (Purchase Order, Inbound Delivery, Advanced Shipping Notification, ...)
- * Store in function of the next step, generally picking for a shipment
- * Avoid the garbage-in syndrome by applying Quality Inspection
- * Perform VAS (value added services) activities during putaway if you can
- * Register deviations in real-time

Efficiency can be gained in the Putaway process by eliminating all non-value adding activities. This implies:

- * Minimize the number of manipulations on the HU (handling unit)
- * Avoid driving an empty forklift where possible
- * Cross-dock to gain efficiency and speed

The steps and activities in the inbound flow depend on many factors, such as the source of supply (vendor, intracompany shipment, production, subcontractor, customer return, ...), the product itself (type of HU, type of storage, ...), the industry (food, pharmacy, construction, ...), the next use and destination for the product, the layout of your warehouse, the size of your company, There is no such thing as a universally applicable model.

Products can come from different sources:

- Vendors (normally via purchase orders)
- Production (in that case based on production orders)
- Returns....

Goods Issue business environment

Most warehouse (not to say: all warehouses) are set-up in order to have smooth outgoing flows. There are several sources causing goods to leave:

- Sales
- Production
- Company “Internal” movements – typically reservation based

Typically, in some way, picking is executed against a request (sales order, reservation). Production may be more complicated, because parts may be brought to production for a series of production orders at once, or even independent of any production order.

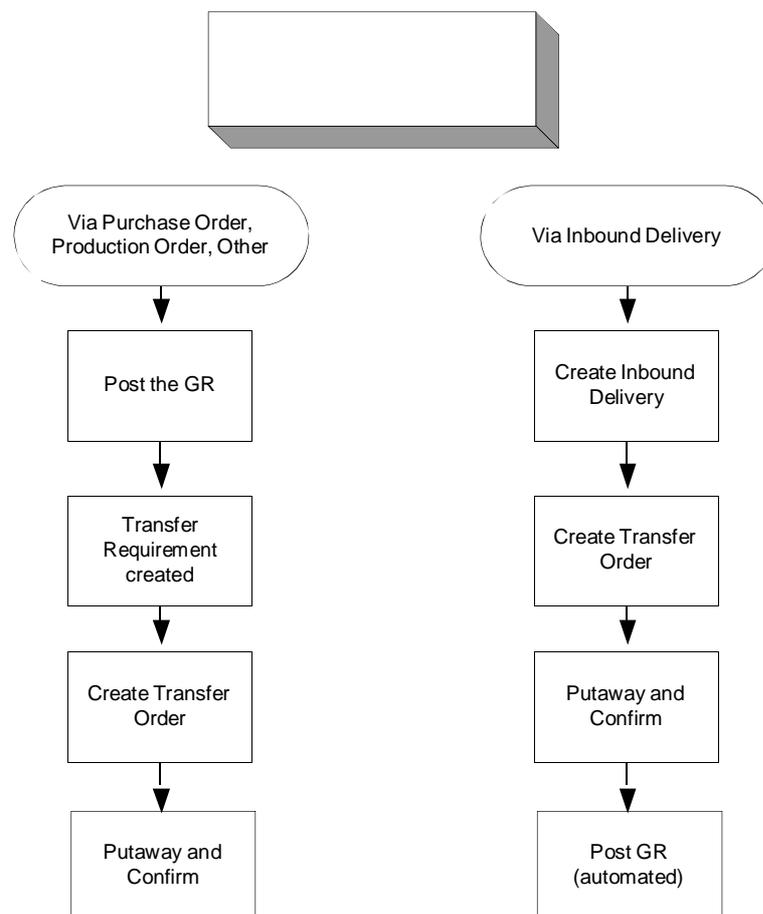
Many warehouses are set-up with the main aim to easily get the products out again. Often, picking happens in smaller quantities than receiving, and often it is time critical. Therefore, more efficiency can be gained in the picking than in the put-away processes..... Depending on the business (many small deliveries, many different small materials) a lot of efficiency can be gained by picking in one go for multiple deliveries or a wise selection of delivery items.

The ERP WM solution for reception

The two basic flows

The two basic methods for inbound processing are:

- * First the IM (Inventory Management) GR (goods receipt) posting, then the WM put-away (see left branch below). Note that the stock is already available for sales while it can still be in the reception zone.
- * First the WM activity (put-away), followed by IM GR posting. The stock only becomes available for sales after put-away.



Based on a good understanding of the two approaches and local requirements one can create variations for these inbound process flows. For example receive a pallet from production:

1. An automated labeler first transmits the pallet and production info to the ERP system to create a put-away TO (Transfer Order). A negative quantity is created in the receiving storage type.

2. The forklift driver picks up the pallet, and scans the HU label. The RF terminal displays the destination bin. The forklift driver drives to the destination.
3. The forklift driver puts down the pallet at the destination location and scans the location identification
4. In the background a job runs that clears the negative quantity of the receiving storage type by performing a Goods Receipt.

Storage Units and Handling Units

The Storage Unit (SU) is used to identify the products of a pallet, a box, ... with a unique number. With one RF scan of this unique number, all pallet info is known such as product, location, The SU exclusively exists in the ERP WM module and was already developed with the first release of WM module (1996).

In 2000 SAP developed the handling unit concept. Handling units offer more than Storage units.

The HU:

- * not only contains the unique identification number of the pallet. It also contains the packaging info.
- * is cross-modular and cross-system. HU 's, attached to an outbound delivery, contain the packaging info, which can be communicated using Idoc and EDI messages to a customer's system.
- * can be nested and can contain serial numbers. However, handling units are in IM (inventory management). The nesting and serial number info is not available in the warehouse module itself.

There is limited integration between the Storage Unit and the Handling Unit. The Storage Unit takes over the unique identification number of the Handling Unit number. It does so for the highest level of the HU. Neither the nested levels nor the serial numbers of a HU are visible in ERP WM. It will require development, to access these data. This places also a limit on the use of TRM. TRM does not support nested HU 's.

Put-away Logic

In ERP WM the search for the destination bin goes very hierarchically. First a storage type search and then a storage section search are performed based on material master parameters and the storage type sequence defined in configuration setup.

Once the storage type and storage section are determined, Storage unit type (the size of the pallet) and Bin type (bin size) can be matched, dependent on your configuration.

Put-away strategies

A good warehouse implementation takes care that the destination bin is automatically assigned by the WMS. A put-away strategy is a SAP method to find destination location for a product or a storage unit in a given zone of the warehouse (the storage type). This put-away strategy is called on during the creation of the put-away instruction (or transfer order). Examples of strategies are: fixed bin location, next empty bin location, add to inventory stock, bulk storage, near fixed bin storage,

By combining certain put-away strategies with a capacity check on the bin, a limit is set to prevent an overflow of the bin location.

However, ERP quickly reaches its limits. Example, in a fixed bin storage type, per material only 1 Fixed bin can be assigned. For fast movers, this may not be enough and get you into trouble to replenish in time. And when confronted with the combination of batch managed materials and fixed bins, we know in ERP WM we are typically heading for some trouble (and development) because of the difficulty to predict which batch will physically be taken.

The ERP WM solution for picking and goods issue

Finding the stock in the warehouse

A storage type search is performed based on material master parameters and the storage type sequence defined in configuration setup.

Typical strategies are supported:

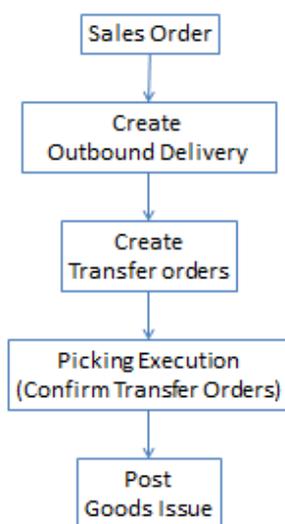
- FIFO or Shelf Life Expiration per storage type.
- Stringent FIFO (getting the eldest stock in the warehouse, except certain storage types)
- Small/large quantities (if the quantity asked is more than indicated in the material master as control quantity, storage types (typically the fixed bin picking) can be skipped (in order to take a full pallet from the pallet storage type).
- Partial quantity management (in order to limit the number of partial pallets)

The storage types that allow to create a picking transfer order (= the document to execute the picking) that does not contain yet which batch or which storage unit to be taken must be configured as 'Bulk' (Bulk typically is used for places where a series of pallets or boxes are put in front of each other and above each other).

Sales Flow

Fundamentally, for sales orders in ERP outbound deliveries are made. For those outbound deliveries, the warehouse transfer orders are made. This eventually can be done for a group of deliveries. The transfer orders point directly from the source bins to the goods issue zone (theoretical bins (often with the delivery number as bin number) in an interim storage type).

2-step picking is supported, which means that in a first picking step picking is done for the total quantity needed for a group of deliveries, and in a second step the goods are split per delivery.



It is possible to make groups of deliveries in waves, but then you group the entire deliveries. This is troublesome, because typically the logic how to get to efficiency is different for small items than for larger items. The way to automate this is not easy, and not very flexible (of course, user exits exist).

If only storage unit management is used, the numbers of the storage units are not copied over as handing units into the outbound delivery (without development). This implies that the customer cannot use the labels.

In ERP, there is a transaction existing (HUPAST) with the aim to be used in a work center (thinking at a desktop PC with a scanner attached. However, in ERP WM this does not mean that

the stock system wise is rerouted to this place where this work center is. With handling unit management, the numbers of the handling units in the warehouse are copied into the outbound delivery. If then EDI is set-up with the customer, he may be able to re-use the same numbers.

Eventually, also ERP shipments are used. If these are used, the transfer order creation can be launched from the shipment document (WMTA output type) and the goods issue can be done from the shipment document instead of doing this per delivery.

Not very known in SAP ECC WM, it is also possible to add Value Added Services. In this case, Transfer Orders are made to the workcenter where the Value Added Services are to be done. At confirmation of the work, the products are then moved further via additional Transfer Orders.

Production replenishment

Fundamentally, it is possible to use the PP interface, or not to use it. In case you don't use the PP interface, you first make the material document (post goods issue of the components needed) which creates a transfer requirement converted into transfer order. The transfer order is used to actually bring the parts. This option is very unnatural, because system wise you remove the parts from stock before production started (and even before production physically got any parts).

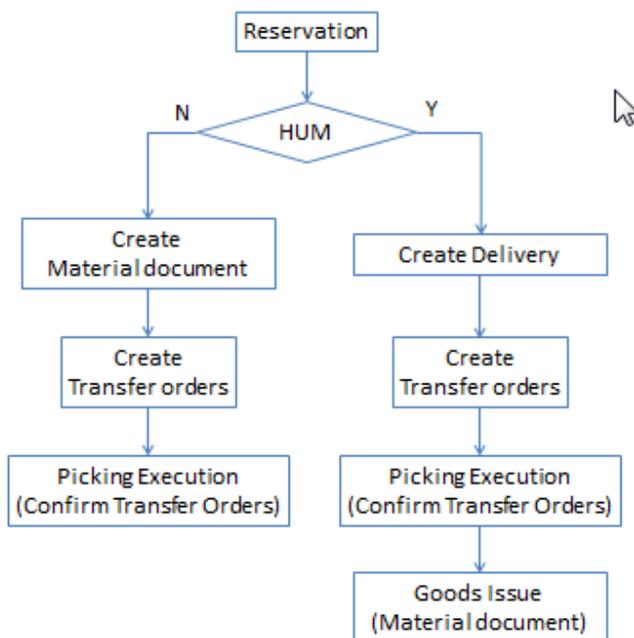
This is why normally the PP interface is used. This supports several ways of working:

- Replenishment (crate parts). In this case, you indicate a minimum stock you want in production for the parts, and when the stock level drops below this, replenishment is done. The draw-back is that you must do the goods issue short after the physical consumption of the parts, which may not be obvious
- Use PP Kanban. This is a separate module in PP, supporting true Kanban (at SAPSTROOM, we are fans of this, because it allows to replenish the production floor regardless the system stock on the production floor and regardless production planning)
- Pick Parts. The Transfer Orders to bring the parts are created when the production order is released. This typically leads to a set of parts dedicated to make one production order
- Release Order Parts. For those parts, the system looks at the total quantity needed for a selection of production orders (and the parts still available) and makes transfer orders for the difference.

Reservations

We are quite unhappy about how this works (without handling unit management) in ERP central WM. The problem is that you first do the goods issue (which forces you to indicate which batches, or which serial numbers were taken, ...). The material document creates the transfer requirement, which is converted into the transfer order for execution. The fact of doing the goods issue first also leads to additional administration in case the quantity delivered does not match the quantity issued (because of rounding problems or because of stock differences).

With handling unit management (also in case of decentral warehouse management), instead of creating a material document an outbound delivery is created, for which the transfer orders are created. Here, the goods issue happens after picking, giving the possibility to indicate which batches were taken and to change the quantities.



In some projects, we did some developments in order to always make the detour via outbound deliveries (so always following the flow on the right) even if no handling units were used.

The EWM solution

EWM system landscape

EWM can operate either in “central operations” or “decentralized” mode.

- * EWM is originally built to operate as a “decentralized” warehouse system. As such, it is fully integrated into the SCM platform. The CIF (core interface) interface is used to transmit master data and organization structure objects from the ERP to the EWM system. The communication of transaction documents mainly uses the qRFC (queued Remote Function Call) technology.
- * In “central operations” EWM runs on the same server and client as the ERP system. However, ERP and EWM still communicate through the CIF and qRFC with each other even when operating on the same client.

Having a separate system has the benefit that performance wise, and looking at the timing when the system should be available, you gain in flexibility. Because even in ‘central operations’ the communication still uses the CIF, qRFC’s.... for the complexity, the choice between ‘central’ or ‘decentral’ does not make a big difference.

The warehouse structure

At a first glance EWM uses the same warehouse organizational structure: Storage types, Storage Sections, (Location Storage) Bins and Quants. But there are important enhancements in EWM:

- The principle is that stock is shown in its physical location. Therefore, the interim storage types as known in ERP WM work in a very different way: no more dynamic bins with document numbers (like outbound delivery document) but always real bins. EWM uses other fields on the quant to indicate for which document the stock was moved
- The use of storage sections in ERP WM and EWM is almost identical. A difference is that in EWM, you can choose whether manually, the user can put the stock in storage sections which are not included in the storage type search linked to the material.
- The bin master records are more or less similar. Some differences:
 - The bin number identification in EWM has to be unique within a warehouse. It’s also longer.
 - The EWM bin has much more fields. We point to the physical coordinates, aisle-stock and level, bin access type (to steer which kind of resources can go there)... Some features are recognizable, like the bin type (to steer which kind of handling unit types can go there) and the verification field (if the worker is supposed to confirm he is on the right place not by entering the bin itself but ‘something else’)
 - You can influence the number of fixed bins to be assigned to a product for a fixed bin storage type (in ERP WM you only have 1 fixed bin per material in a storage

type).

(print screen of an EWM bin)

- The quant keeps the same role.
- The EWM fields are longer, which may enable you to set up a more comprehensive structure.

In addition to this basic structure, EWM introduces the Activity Area (AA). A slight comparison for the EWM AA is the picking area of the ERP WM system. For each activity, dedicated activity areas are set-up, giving the possibility to steer the execution differently for each. Steering here means sorting, giving the work to other resources....

Material Master data and Packing Specification

The EWM material master has a warehouse view, a slotting view, a packaging view and storage type views. These views have additional parameters to enable the enhanced or new functions of EWM. As far as put-away is concerned, you still find the storage type placement indicator and the section placement indicator amongst the steering parameters.

The packaging specifications play a more prominent role in EWM. The palletization data of warehouse view 2 in ERP WM is replaced by Pallet Packaging specifications. There are different types of packaging specifications. EWM uses the Packaging Specification Engine of the SCM platform. Using condition technique, the HU packing (or pallet creation) checks the condition records to find the proper packaging instructions.

Multi-step movements

Here EWM distinguishes itself strongly from ERP WM:

- ERP WM is based on the single step movement. A product moves from a source bin to a destination bin. This movement is controlled by the “warehouse movement type”.
- EWM can operate in a single or multi-step mode to move a product from a source bin to a destination bin. Examples:
 - Products needing to undergo quality inspection of VAS. If this is the case, those products can be routed via one or even a series of work centers (places where some work like packing, VAS or quality inspection is executed)
 - Products entering narrow aisles: a first step brings them in front of the right aisle, a second step represents the put-away by the narrow aisle forklift
 - Offloading to a staging area, then put-away to the final bins....
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The term “warehouse movement type” is replaced in EWM by the term “warehouse process type”.

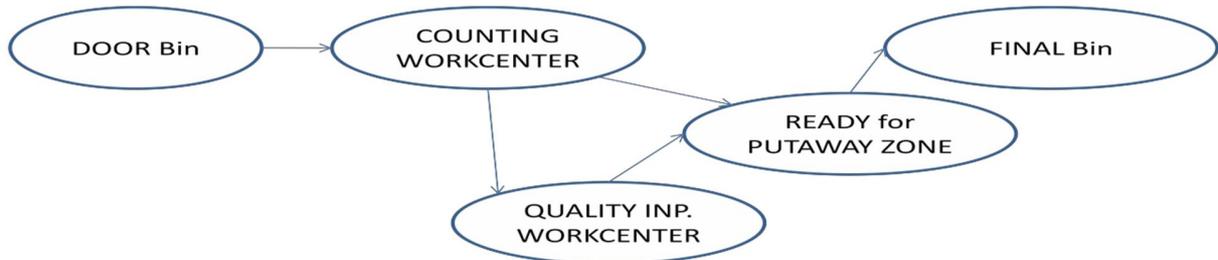
The Warehouse Process Type also has an enlarged set of control parameters compared to ERP WM. One of these parameters is the “Storage Process Type”. The Storage Process Type groups together the steps in a chain of interim storage types to be followed during the put-away process. This way a HU can move from one interim storage type to another interim storage type until it reaches the final storage type. An example of an interim storage type is the De-consolidation Work Center.

For picking, it works in the same way (with the exception that in the goods issue process, the Quality Inspection Engine does not play).

TYPICAL ERP WM RECEIPT



TYPICAL EWM RECEIPT



- In the multi-step movement EWM distinguishes two types of storage control, that can be combined together:
 - ☞ The 'Layout oriented storage control' maps the physical movements of the product. It is used to split the process in different steps for physical reasons: maybe you first put the pallets on the head of the rows before putting them away with the actual reach-truck, or you use a conveyer or elevator...
 - ☞ The 'Process oriented storage control' refers to additional processes that need to happen on the HU such as unloading, counting, quality inspection, packing, unpacking, de-consolidation,
 - ☞ Loading or offloading can be made very visible, as movements between bins (door staging area bin to door bin or vice versa)
- The multi-step movement in ERP WM is mostly resolved by additional development. The use of the identification point or two step confirmation is as far as the standard possibilities go.

The EWM solution for Goods Receipt

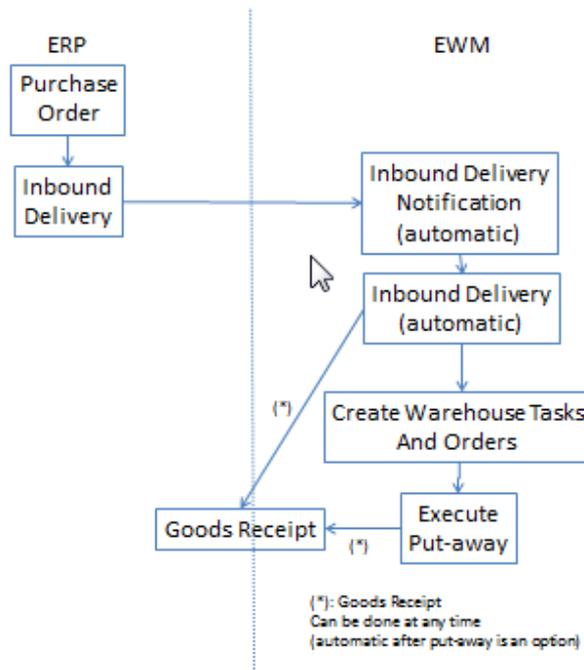
SAP uses the delivery as the cut-off and communication document between ERP and EWM.

For the ERP inbound delivery, in EWM 2 inbound delivery categories are made:

- * The Inbound Delivery Notification (IDN), which is the copy of the ERP Inbound delivery and the changes made to it by the ERP system. There is a one to one relationship.
- * The Inbound Delivery (ID) is created automatically based on the IDN. The ID is the IDR, enriched with warehouse control parameters such as the Warehouse Process Type. The ID is the central reference document for all subsequent warehouse operations like the warehouse tasks creation, the GR, the status updates

The figure below shows the link between the different documents used in a classic inbound process. The aim of the 2 categories is to avoid that due to missing data, the ERP document would get stuck in a queue. If data are missing, the idea is not to be able to create the inbound delivery in EWM, but have at least the Delivery Notification.

The GR posting can be done in 2 steps (but this is no obligation). If in 2 steps, the idea is a first GR posting taking place when the goods arrive on dock. This is a GR in a temporary storage location on the ERP side (often called a 'Receipt on Dock' location). When the product is placed in its final bin location, a transfer posting is sent to the ERP system to move the product to the final storage location. This makes the product available for the outbound delivery creation. Note that in ERP WM something similar is possible.



More in general, in EWM we can choose when the Goods Receipt is to be done. For some processes (example: some forms of cross docking...) the goods receipt should be done as a first step.

A warehouse task can be compared to a single TO-item in ERP (more correct definition: a warehouse task shows a single thing to be done). The warehouse order (WO) is a grouping of different warehouse tasks. The idea is that the warehouse order is a group of tasks to be performed by a warehouse worker ('in 1 walk through the warehouse'). Here the big difference is that ERP WM does not offer much transactional support for the WM groups in RF, nor real optimization logic in how to make them. In EWM, the warehouse operator will be confronted with the warehouse order (and the tasks that were grouped under it).

After the confirmation of a warehouse task, the status of the EWM inbound delivery is updated and depending on when the goods receipt happened a message is sent to the ERP system to update the ERP Inbound Delivery.

EWM offers the possibility to interface purchase orders to EWM, and create the inbound delivery request straight in EWM.

In either case, EWM requires you to work with inbound deliveries for the goods that you are receiving (in ERP WM, you could do without them).

Enhanced put-away logic

The logic for finding the put-away bin is more or less the same between EWM and ERP WM. There are however several important enhancements.

- ERP WM does this in a very hierarchic way; first storage types search, within the storage type a single direction search for storage sections. As soon as a good bin is found, ERP stops
- EWM is much more flexible.
 - Each combination of storage type, section and bin type (matching storage type search, section search and bin type search criteria) can get evaluation points. In the end, EWM will choose the bin which gives the least evaluation points. This allows us e.g. to balance between the need for fast movers to be in the fast area, but small pallets not going in the large bins there if in the slow moving area still small bins would be available.
 - Fixed bins can work in a much more flexible way. One material can have multiple fixed bins in the same storage type...
 - Bulk is a put-away strategy which is typically used for bins where several pallets of the same material are put in front of and on top of each other (of course, as valid for places where a lot of boxes of the same material would be put on a shelf). Typically, in such storage types it is hard to predict which pallet (box) is the easiest to be reached. In ERP, this is the only put-away strategy for a storage type which allows to create picking transfer orders that do not force in advance the picker which batch or which storage unit he should pick. But ERP Bulk comes with quite some limitations (f.e when multiple materials should be in the same bin...) In EWM, other storage type mechanisms allow the same flexibility for picking.
 - EWM can be configured to only determine the destination storage type (and eventually the section) whilst the worker chooses the bin himself at confirmation
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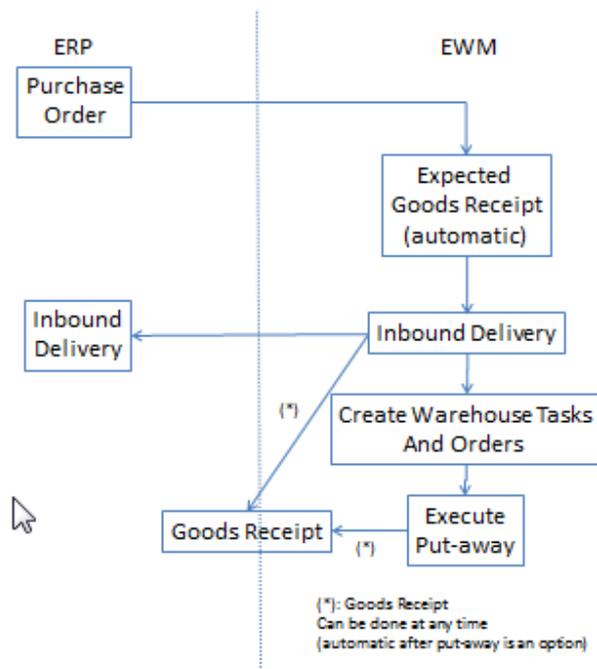
EWM also allows to mix stock packed in handling units and 'loose' stock in the same bin.

Expected Goods Receipt (EGR)

EWM Expected Goods Receipt serves two purposes:

- To create a goods receipt starting from EWM based on the purchase orders having been replicated to EWM. The creation of the inbound delivery is initiated in EWM (and it is replicated to ERP). This possibility offers several advantages:
 - ☞ Additional product being received can be processed without having first to pass by the ERP system.
 - ☞ Objects that did not create an inbound delivery in the ERP system (e.g. production orders) can be processed with an inbound delivery via EWM.

In process of creating the inbound delivery via EWM, it remains possible to check consistency with the ERP system via a BADI or even to initiate first the ID on the ERP system.
- To estimate the future inbound workload for workforce planning. ERP WM has some possibilities with rough workload estimates. However EWM scores stronger here, due to creating the EGR ID, refreshing it on a regular basis, and the condition editor and formula editor for calculating the workload.



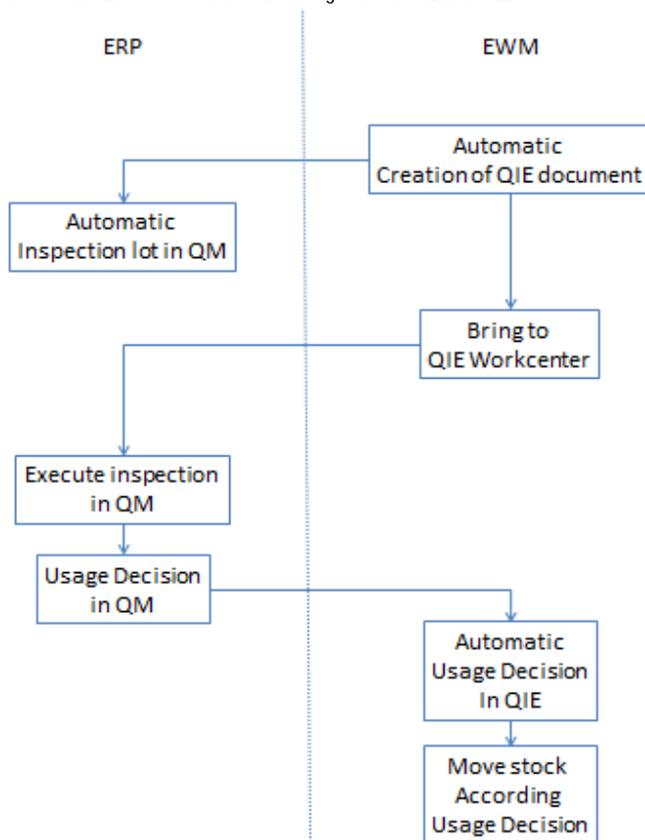
EWM Quality Management

Often sampling or a quality inspection needs to take place at reception.

EWM uses the newly developed Quality Inspection Engine (QIE) to map its inspection processes (sampling, creation of inspection documents, record inspection results, ...). A choice of 6 different inspection object types, relevant for warehouse operations, can be activated (HU inspection, Counting ID, ...). EWM can use the QIE stand alone or integrated with the ERP QM module. Different sampling methods of the QIE can be used.

Stand-alone QIE is typically OK for 'light' quality inspection (missing however a link back to vendor evaluation), for in depth inspection, the advice is to activate the link between QIE and ERP QM and to execute the inspection with ERP QM.

Flow in case ERP QM would be used together with EWM QIE:



Depending on your set-up, EWM can intelligently route your products to a quality inspection work center when needed.

Yet, the ERP QM module is very powerful on its own, and provides feedback to MM vendor evaluation. Its functions are readily available to ERP WM as they are running on the same client. But the combination of ERP WM and ERP QM is not flexible and the combination of inbound deliveries in ERP and ERP QM requires development (without handing unit management). So we think the EWM solution here again is better – certainly if the QIE – QM integration is set-up.

Cross Docking (CD)

Cross-docking allows for a direct move from the receiving area to a shipping staging zone avoiding a final storage in the warehouse. The major advantages are speed of the goods flow and saving resource time (labor and machines). However, sometimes it's hard to get this physically organized well, and of course it may ruin FIFO principles....

ERP WM offers limited cross-docking functionality; there is planned cross-docking and opportunistic cross-docking. Only full HU's can be cross-docked.

EWM offers new possibilities for planned and unplanned cross-docking.

- EWM can do 'opportunistic' cross docking on its own initiative. This means that for certain materials (where FIFO is not so important) EWM can be set-up to prefer stock received in dock in the inbound flow to be picked above stock lying in the warehouse.
- EWM can also steer transportation cross docking. This is the kind of cross docking that happens when e.g. a full truck holing a whole series of deliveries for multiple customers leaves to a distribution center, where it gets split-up over several smaller trucks
- APO or SAP Retail can be used to steer cross docking as well.

The EWM Picking and Goods Issue solution

Finding the stock in the warehouse

From a distance, EWM is quite similar to ERP here. There is also a storage type search, and the same strategies are supported. BUT, EWM is more flexible because:

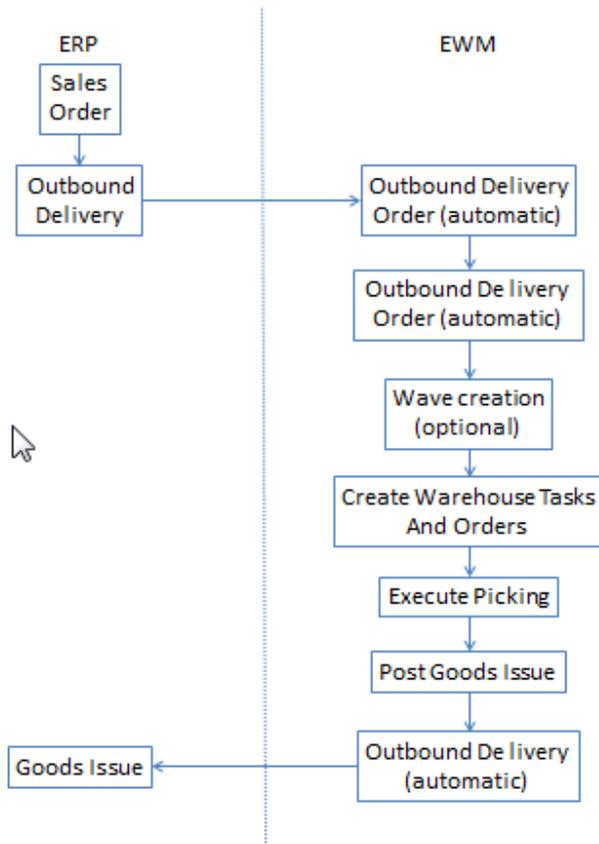
- You can make groups of storage types on which you use your own rule (strategy)
- Via packing specifications, depending on the quantity asked, you can determine a different storage type search (and/or storage type group search). Hence, annoying problems from ERP (e.g. via the control quantity you skip a storage type (your picking bins) but accidentally all stock is in that storage type...) can be avoided.
- All typical strategies from ERP WM are supported. In addition, you can make your own rules (strategies), i.e. to balance the picking work over multiple bins.

Independent from this, it is possible to let the worker decide on the pallet or batch he takes (in ERP this is only possible with bulk storage types).

Sales Flow

Fundamentally, for sales orders in ERP outbound deliveries are made (like with ERP WM). But now those deliveries are sent to EWM, where they become outbound delivery requests. They are enriched automatically and converted into outbound delivery orders. For those outbound delivery orders, the warehouse tasks are created (they are automatically assembled in warehouse orders). The resources (workers or automated systems) get the warehouse orders via which they execute the warehouse tasks. In the end, goods issue is posted. Via the automatic detour of an EWM outbound delivery, the goods issue is posted in ERP.

In addition, the outbound delivery items can be appended to waves (manually, and/or via condition technique). This can be done in a very flexible way (it would even be possible to get the same delivery item in more than one wave, e.g. when a full pallet and some additional quantity are required). Whereas in ERP, this is not flexible, EWM waves are very flexible and very usable. Along with the warehouse order creation logic, the waves are one of the key points in getting very efficient work packages to the warehouse floor (with the potential of an important efficiency increase). 2-step picking is supported as well, and may add efficiency to the warehouse execution.



The combination of waves with the warehouse order creation rule, is meant to give very efficient work packages for the resources.

The resources get the warehouse orders, via which they execute the underlying warehouse tasks.

Via the multi-step logic, it is possible to reroute the materials via multiple steps and eventually work centers.

Handling Units can be taken over as pick handling units, but there is also strong logic available to create pick handling units. The handling units end-up in the outbound delivery, which makes them available for customers using EDI.

ERP shipments are comparable to transportation units (a type of handling unit representing a trailer or a train wagon) and vehicles (a combination of trailers or wagons (which would be the train)) in EWM. ERP shipments can become EWM transportation units (and/or vehicles) and vice versa.

Direct Outbound Delivery

EWM can also take the initiative to get stock out. Examples:

- * The customer comes to the warehouse counter. In EWM an outbound delivery is created for which the warehouse tasks and orders are created. Picking is done. After picking, EWM can cause the billing to be done and the Goods Issue (in both sequences). ATP can be covered from ERP, APO or in EWM itself.
- * Other processes like Issue to cost center are similar...

In ERP WM, this would be comparable to the less flexible transaction VL01NO creating an outbound delivery without preceding reference.

Production replenishment

Fundamentally, here EWM is quite similar to ERP, of course adding the same flexibility as for the sales flow. In addition, it is possible to have a dedicated warehouse for the production stock.

Depending on the organizational settings (production stock in same Inventory management storage location, other storage location, linked to the same warehouse, not linked to a warehouse or even linked to dedicated production warehouse), for production order based staging, ERP outbound deliveries will lead to posting change deliveries, outbound deliveries and eventually even inbound deliveries in EWM

Reservations

Here, from ERP delivery documents will be sent to EWM. This gives the required flexibility to indicate which batches, handling units or even serial numbers were taken after the picking, and to cope with differences.

Some additional features of EWM

Slotting and rearrangement

Slotting is the determination of the optimal put-away parameters to store a material and to optimize the picking operations. This is based on product and storage requirement data, packaging data and demand forecast.

During the slotting calculations, EWM determines planned material parameters like put-away control indicator, put-away section indicator, allowed bin types and maximum quantity per storage type.

Slotting is often scheduled, for instance every week in fast changing environments.

Rearrangement goes one step further: EWM will propose to transfer stock if the current stock situation is not optimal regarding the results of the slotting process.

Serial Number support

For serial number managed products, in EWM you can specify three levels of control:

- * Control at delivery item level: serial numbers are recorded only for the activated inbound or outbound delivery item types.
- * Control at warehouse level: serial numbers must be recorded at each goods receipt and goods issue, and you can see which serial numbers are in the warehouse (without knowing their exact place).
- * Control at storage bin level: serial numbers are captured for each task confirmation in the warehouse. Of course, then you can see which serial number is exactly where.

When receiving EWM can first assign a provisional SN number, which will be replaced by the real SN number when a detailed scanning happens of each individual piece. This can be combined with RFID or other automation methods.

The consequences are that in EWM, you can track down where each serial number is and what happened to it (if you want).

Serial number capturing and tracking is non existing as such in ERP WM (there you typically overcome this by implementing handling unit management and ensuring that each piece is packed in its own handling unit – quite a heavy solution).

Value added services (VAS)

If a composed HU is received, it can first pass the De-consolidation Work Center for unpacking and creation of new HU 's before the put-away process proceeds. Kits can also be created before placement into stock. In ERP WM VAS activities are only foreseen for

outbound deliveries.

Yard Management

Yard Management is an integrated part of EWM. Transportation units and vehicles are created to trace the presence of trucks on the yard.

EWM integrates Yard Management in the warehouse operations and uses warehouse tasks to move transportation units from a checkpoint to a parking space (mapped as a storage bin) or to a warehouse door, before starting the unloading process.

A feature, which does not (yet) exist in EWM is the door and lane scheduling. Door and lane assignment exists in ERP Yard Management.

Bonded warehouse

A Bonded warehouse is used to store products that are not yet imported in the EU (i.e. no import taxes and or VAT are paid). This requires an authorization to keep stock bonded (i.e. under customs control).

EWM uses Stock Types to distinguish the bonded stock as a separate stock category. ERP has the Stock Categories available, in quality inspection, blocked and return stock. EWM uses the term Stock Types to make the same distinction. In addition new stock types can be defined by the user. SAP Global Trade System (GTS) can use these stock types to make the link with the Bonded Warehouse.

Catch weight

Probably your products have different weights. However, you may also have weight variations within one product. Catch weight enables you to capture the weight while executing a warehouse tasks, and put that on the quant.

In ERP WM this functionality does not exist.

RF Transactions

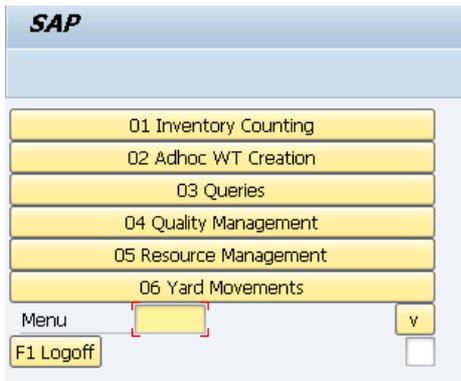
Basically, the RF is routed via ITS Mobile (same as in ERP WM). But EWM comes with much more RF transactions and it's easier to change their screens (out of the box, there may be too much information). In addition, there is a standard transaction for voice picking.

Some of the features in the RF area which only exist in EWM:

- Semi system guided. This means that the worker is sent to a source bin (e.g. the incoming staging area) where he can take any handling unit. After scanning the handling unit chosen (the easiest reachable one) the system shows where to bring it.
- User decides bin. This means that the warehouse task is created without a destination bin (only storage type and eventually storage section), and the user decides himself on the bin.

- Task interleaving. This means that the system switches between a warehouse order in the inbound queue and a warehouse order in the outbound queue (avoiding driving empty too much)
- Ad hoc movements. Finally, SAP gave in and made RF transactions which allow the workers to move stock on their own initiative (without an order having been created in advance)

Part of an RF submenu.....



Material Flow Control System

SAP EWM comes with direct support for automatic warehouse systems like conveyers and cranes. Their PLC's can be instructed directly by SAP EWM, without the need for middleware. The messages (telegrams) are send based on RFC basis and can be monitored very easily from EWM.

Ad Hoc movements

In ERP WM, it is possible to move entire quants (LT10 transaction), storage units (LT09) or part of a quant (LT01). But if you want to move part of a quant, you need to manually enter a lot of information.

In EWM, there are RF transactions to do ad hoc movements, and full screen transactions. The full screen transactions allow you to select a 'quant' and move part of it (so the ideal marriage between LT10 and LT01).

Voice picking

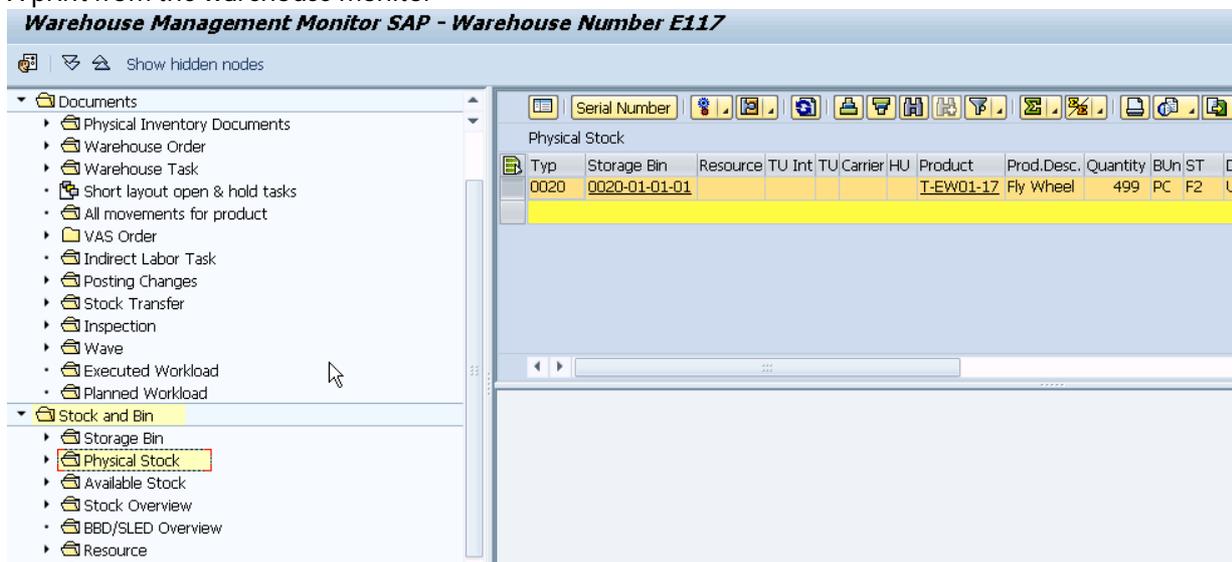
In EWM, voice picking is supported out-of-the-box. A dedicated transaction is existing. In ERP WM, in practice voice picking always requires a transaction to be programmed.

Monitor and cockpit

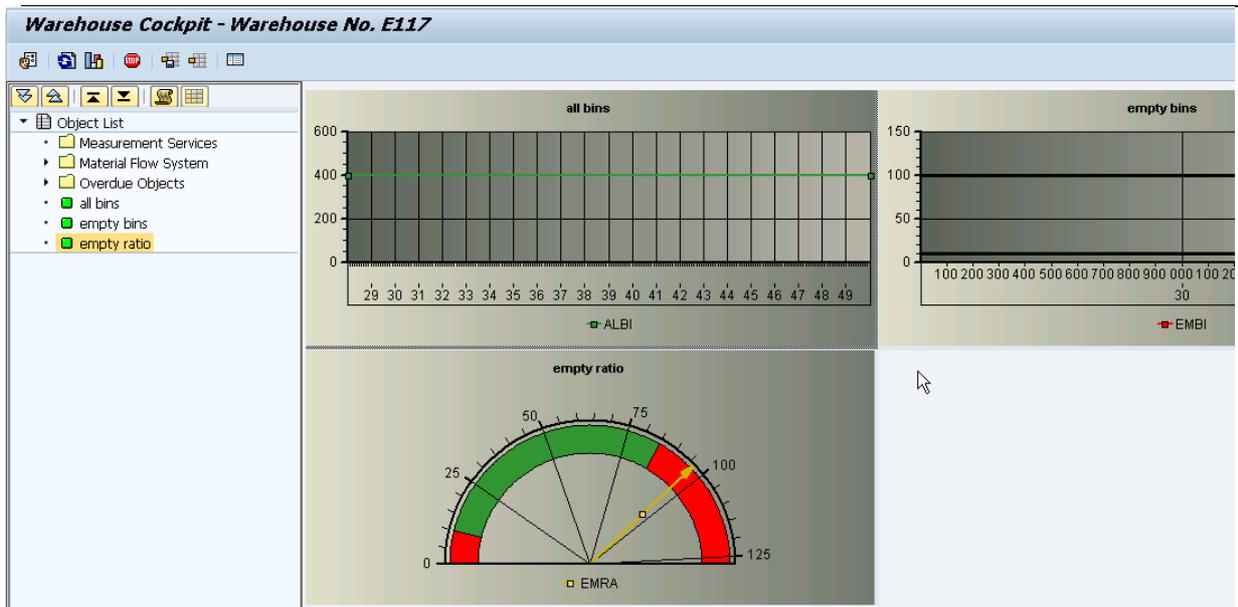
EWM comes with

- Warehouse monitor (a central transaction holding a whole series of inquiries, easy to customize) via which it is easy to access all kinds of inquiries (stock, delivery documents, warehouse orders/tasks, VAS orders....). It's very easy to add own variant nodes (e.g. to access in 1 click all open warehouse tasks).
- Warehouse cockpit ("Measurement services"). Here it is easy to make graphical screens and get alerts e.g. when there are not enough empty bins anymore or when too much warehouse tasks stay open....

A print from the warehouse monitor



Warehouse cockpit: Performance dashboard (here following-up empty bins).....



Glossary

Some definitions (note: those are not the official SAP definitions, but an effort to get a more practical description):

- Storage bin: Both in ERP WM as in EWM the bin is the place where the stock is. In ERP, interim storage types often have 'dynamic bins': these are bins with a document number (or cost center) as bin number and only exist when stock is 'on the move'. They are not physical bins. In EWM, this concept was not taken over (EWM uses other fields to know for which document the stock is moving, and follows the principle that all stock shown is shown on its physical place). Another difference between ERP and EWM here is that EWM bins are longer, have more info (like their physical coordinates) and must be unique within the warehouse (in ERP they are only unique in a storage type).
- Storage type: Storage types both in ERP as in EWM group storage bins which work in the same way for put-away and for picking.
- Storage section: both in ERP as in EWM storage sections are a subdivision of the storage type. They are meant to logically group similar products in the same area. Example: put fast moving materials in the first aisles or tiers, whereas slow moving materials are put in the back of the warehouse. In EWM, the storage sections are not obligatory anymore.
- Picking area: in ERP WM, the picking area groups bins for picking
- Activity area: in EWM, the concept of picking area was enlarged and is not valid for any kind of operations. Via the activity area, you typically steer in which sequence the actions are done (bin sorting) and which resources get the work.
- Resource: In EWM, resources execute work in the warehouse. Typically this represents the

worker with his scanner, or an automatic crane....

- Transfer Order: in ERP WM this is the document via which stock is moved through the warehouse.
- Warehouse task: in EWM this is a single movement. It would be comparable to a Transfer Order item in ERP WM.
- Warehouse Order: in EWM, this is an assembly of warehouse tasks, representing 1 'walk through the warehouse' for a resource. In ERP, this would be the entire Transfer Order.
- Warehouse movement type: in ERP WM this defines the kind of movement done and how it should be executed.
- Warehouse process type: in EWM this defines the kind of movement and how it should be executed.
- Warehouse order creation rule: in EWM this is the method used to assemble warehouse tasks into a warehouse order. There is a lot of power in there, with the aim to get efficient work packages for the resources. Example: while picking small items making warehouse orders of 20 items with a weight and volume limit, sorted via the pick path. So the second worker starts where the first would stop....
- ...
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Conclusion

SAP WM and EWM both deliver value by optimizing warehouse operations and providing monitoring and controlling functionality. Choosing between them is not straightforward, and depends on required functionalities, and the size and complexity of your operations. Main drivers towards EWM are:

- The need to follow different movement steps in the warehouse
- Serial number management
- Move flexibility in picking and put-away strategies (multiple fixed bins, 'bulk logic'...)
- Better and easier follow up via the warehouse monitor and cockpit
- Need for more and flexible RF transactions
- Voice picking
- Material Flow Control system
- Better integration between logistics in QM
- Better follow-up VAS
- Increase warehouse efficiency via waves and warehouse order creation rule
- Better cross docking
- Use Handling Units without getting stuck in there severe approach on ERP
- Need for labor management (not explained in this white paper)
-

Generally, EWM is much more flexible and comes with more and better functionalities everywhere. The draw-back is that it is more complex to set-up (not to operate though), so if your warehouse is small and simple, the investment in EWM may not give a fast return.

Contact information

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