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Is Online Order Picking Really Too Expensive?

Ist Online-Kommissionierung wirklich zu teuer? (Artikel in Englisch)

Est-ce que la préparation d'ordres en-ligne coûte vraiment trop cher? (article en Anglais)

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Is Online Order Picking Really Too Expensive?

In other words: Why does offline order picking require more sophisticated warehouse management software – is it really less expensive to do without online radio communication or pick-to-light technology?

When looking into logistics-specific journals about warehousing and warehouse management systems (WMS), you will usually find articles about fully automated high bay warehouses, automatic small-parts warehouses and miles of highly sophisticated conveyor systems and sorters, or about picking workplaces where pallets or bins are brought to the picking staff in the right picking order, and so on. Order-picking may also be performed as pick-to-light or via radio data terminals (RDT). Without a doubt, these systems need specific warehouse management software on different system levels in order to work as designed and to work adequately to the customers' requirements. These systems obviously tend to be high-end solutions for warehouse management, both from a technological and a cost aspect.

But at the same time and much less dramatic and infrequently mentioned, are the many manually operated distribution center warehouses consisting of rows of racks and shelves where picking staff follow an order list that is afterwards acknowledged and possibly corrected on a stationary client PC. Sometimes, they also include a high-bay warehouse serving as reserve stores for replenishing picking locations. At first glance, software solutions for these types of warehouses look as if they are much less sophisticated and less expensive. Often they are: what is basically needed for printing a picking list is a stacking table describing which items in which quantity are stored in a specific location, and a sorting criterion (e.g. a measure of distances) in order to optimize the picker's path along the shelves.

As a first step to prepare the picking list, the WMS software will search the stacking table for each item of the customer's order, reserve the required quantity in a pick location, then proceed to the next item in the next pick location, and so on. In some cases, the quantity in the pick location may not be sufficient enough to cover the required quantity of the order. In this case, there are 3 basic possible reactions: 1st, a search for other pick locations containing the same item – if these can be found a reservation is made at one or more of these locations until the required quantity is reached; 2nd (if the 1st step fails), a search of the reserve area to initiate replenishment at the pick face and create a pick line for the same location or the location to where the reserve quantity will be brought; 3rd (if the 1st and 2nd steps fail), a report is made to the materials management system that the order could not be filled. Possibly this would then affect a cancellation of the customer's order or supply a partial delivery and a back order. Up to this point, a RDT system or pick-to-light does not operate differently.

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What happens next is printing the pick list. One of the pickers will collect it from the printer, and follow the indicated pick lines, put the appropriate quantities of each item on the list into a cart or box and mark the pick line as completed. An unusual case may be that he will pick the whole quantity in one location and then have to wait for the replenishment-handling unit (box or pallet), or continue and go back later to complete the order. This will cost time. If the system were pick-to-light or RDT-controlled, the picker would continue on his way, and be sent to the location again once the replenishment has been completed. After having finished picking, he will go to a stationary PC and acknowledge the list (maybe supported by reading a bar code from the pick list). As long as everything is picked in the right quantity, and physical stocks in the locations are equal to those kept in the system's database, everything is fine.

Let us now take a look at a situation that will occur every now and then: there may be a difference between bookkeeping and reality. There are many reasons that could cause a difference: errors during the goods-in procedure, errors in counting when picking, etc. As a matter of fact, there will be a difference. It may be positive or negative. Normally, negative differences will strike first. The picker will find less quantity in the location than marked on the pick list. He will then write the quantity actually picked on the list and continue on his way. At the PC, he will deviate from the usual acknowledgement, and enter, line by line, the quantity actually picked. This will do for the current order, but it does not yet correct the quantity in the system. Other orders planned to be picked on that location would encounter the same problem. On acknowledgment of the corrected pick list, the system will print a new pick list for the missing quantity (leaving out the location where the difference occurred), eventually creating a replenishment order or in some cases make a report to the materials management system that the order line cannot be fulfilled as required.

How would a system with online-picking via RDT or pick-to-light handle this case? The picker enters the quantity that he has picked and confirms that the location is empty. The system will then update stocks online, and the new quantity on stock will immediately be valid. Other locations (pick or reserve-locations) will be checked and if the required quantity is available, the new location will be shown online and possibly ordered according to an optimized path. If we consider a pick-to-light system, the picker will enter the quantity that he has picked and confirm that the location is empty by pressing a certain button on the location's display unit. The background action will be the same, some other location where the item is available will light up, and another picker will pick the required quantity accordingly. Even if two pickers would access a location at the same time, they will work in a defined sequence; database transaction handling will prevent undefined situations in stock keeping. In any case, all information is immediately available. If the person entering the difference is authorized to perform inventory booking, the entered quantity may immediately be booked into the system as valid (otherwise it would have to be confirmed by an authorized person).

If a positive difference occurs, i.e. a quantity remains in a handling unit or location when it should be empty, online systems will usually ask the picker to confirm that the box or location is empty or else enter the remaining quantity. The person will enter the remaining quantity, and it will immediately be booked into the stocks and considered for the next picking cycle. In the pick-to-light system, the picker will also be asked to confirm that the location or handling unit is empty or to enter the remaining quantity. When picking is performed on a pick-list basis, normally the picker will not recognize that the box in the location ought to be empty when the current action is completed. Either the next picker or the person performing the replenishment will notice that there is something left. When the replenishment box is brought to the location, the person may add the remaining parts into the new box, but this will not update stocks, it will perpetuate the difference between booking and real stocks. In order to update the system correctly, he will need to mark the location as locked and then go to the client PC and update the quantity. But how to mark the location as locked? Should he always carry a set of signs with him for this case? How many of them would he need? Another way of handling is to lock the location from the client PC and then during a period of time where no picking is performed to correct stocks.

Let's suppose there is only one picker in a picking zone and only one pick list performed in a period of time, (i.e. only on acknowledgment of the preceding list a new list is printed), the differences might be booked into the WMS in the same way as in the case of online-communication without any problem. Systems designed for this type of use may indeed be less complex and thus less expensive than online-communication systems. The only fault that could possibly occur is the person forgetting to enter the difference in the system on his or her return and to acknowledge the list wrongly, that is, as a total. In many cases though, there are more than one pick list issued at a time, and more than one picker working in the same zone (i.e. the same group of locations, the same aisle, etc.). In this case there is no way of deciding what the actual stocks are once a difference is encountered. I am going to explain this in a little example:

Let's suppose there are two pick lists each containing a position that accesses a certain location containing a quantity of 100 (booked in the system). The first list requires a quantity of 40, the second one a quantity of 30. After completion of both lists, the remaining quantity ought to be 30. Let's suppose there are actually only 35 parts in the location.

If pick list No. 1 is served first and entered first, the system will see a pick of 35 and conclude that the location is empty. It will then launch a replenishment order for this location. The second pick will show zero, and again the system will conclude that the location is empty. But, if in the meantime further lists have been printed and partly picked, does the amount zero from the second pick refer to the first handling unit being diminished to zero by the first pick, or does it already refer to the replenished handling unit (again containing a quantity of 100) that has been transported to the location by the replenishment? Nobody knows, and nobody can decide.

If pick list No. 2 is served first and entered first, the system will see a pick of 30 and a second one with a quantity of 5, and again will conclude that the location is empty. This seems to be the simplest case, as there is only 1 pick with a difference.

But what if pick list No. 1 is served first and entered second? The first data that are entered in the system are quantity zero, so the system should assume that the handling unit was empty on arrival of the picker. It will again launch a replenishment order for this location. The next information it will get into the system is that 35 have been picked and that the location is empty. Does this refer to the first handling unit, only as a consequence of non-sequential data capture, or does it already belong to the new handling unit that contains again only 35? Master data could be set wrong to 100 instead of 35; this is a plausible explanation. Do we then have to fear that after finishing all picks, only a quantity of 30 is left in total (after printing a new list for the missing 5 parts)?

If pick list No. 2 is served first and entered second, the system will first see a pick of 5 remaining zero, will launch replenishment, and then see a pick of 30. What are the remaining stocks? Is it 70 in the location and 170 in total, or is it 100 in the location and 200 in total?

As an overview of the cases above, see the following table, the variants showing different possible interpretations of the same case.

Variant	Order of picks	Order of entry	Stock in location	Total stock
1	1 -> 2	1 -> 2	0	200 (before replenishment)
2	1 -> 2	1 -> 2	0	100 (after replenishment)
1	2 -> 1	2 -> 1	100	200 (unique, after replenishment)
1	1 -> 2	2 -> 1	0	200 (before replenishment)
2	1 -> 2	2 -> 1	0	100 (after replenishment)
3	1 -> 2	2 -> 1	0	35 (after replenishment & master data fault)
1	2 -> 1	1 -> 2	70	170 (if after replenishment)
2	2 -> 1	1 -> 2	100	200 (order changed)

In simple words, the remaining quantity in the location cannot definitively be calculated (supposing that acknowledging of replenishment movements happens afterwards on a local client, too). We could make some assumptions, but we can never be sure.

Now, this is the essential point. In order to make sure what is really in stock, we will have to block the location and start an inventory on it. But what will happen to following pick lists that require the same item? Will they need to be postponed until inventory has taken place? How will this affect delivery on time? As can be seen, at least for large-scale picking, the consequences may be severe.

We have until now only considered negative differences. If there is a quantity left in the handling unit when it ought to be empty, the system will normally initiate replenishment, and the person arriving with the new box will find something left in the previous one. He can of course in most cases add the quantity left to the new one, but this does not affect the booked stock in the system.

In order to do it right, the location would also need to be blocked and the quantity updated. If there is a restriction on production lots or best before date, things are more difficult. Then an update is compulsory before continuation of picking. The procedures to be performed are the same as those described above, are also time-consuming and requiring additional action performed by staff.

Systems that have not been designed to cover these problems will usually fail, and warehouse staff will have to manage these issues without system support, e.g. by putting a tag to the location "Don't touch / has to be clarified," then counting the quantity in the location, eventually compare it to pick lists being processed, and finally make a decision about what the actual stock should be. This is, of course, a tedious and time-consuming procedure that may at the "right" time prevent deliveries being shipped in time and backlogs for the next few days. Once a difference occurs, problems may keep users on the edge of despair for days. When the size of daily orders is sufficiently high, operations cannot afford to work this way, thus must try to find a workaround, which also will cost additional staff and time: e.g. take a handling unit from the reserve area; take out the missing parts; then manually change the quantity in that unit to x – m, where x is the original quantity and m the missing quantity. We can say in this case, that the less expensive (in investment) system will continuously cost more in daily operations. Unfortunately, there are many systems of that kind in existence. What needs to be done in order to make a WMS capable to cope with the differences occurring while offline-picking is performed? In the first place, we need to have a more sophisticated stock administration system, more fields to distinguish between different types of stock, and both the reserving strategy and order processing system must be adapted. There are certainly several solutions: one such solution could be to have fields as "confirmed quantity," "reserved quantity" and

"assumed quantity" together with a block status and blocking reason. A data record describing total amounts for an item would have to contain fields as "confirmed quantity," "reserved quantity" and "assumed quantity," and "blocked quantity." As long as no differences occur, the assumed quantity would be equal to the confirmed one. In the case of differences, the confirmed quantity would have to be set to the possible minimum, i.e. zero, and the assumed quantity could be set according to some algorithm that is derived from the most probable explanation. Further order planning could then be performed according to assumed stocks (hoping that the assumptions are true), and only the inventory results being entered into a correction dialog would bring confirmed stock and assumed stock to the same value again. More detailed explanations would expand the size of this article. What I wanted to show is that there needs to be some more thorough considerations in software design to cope with problems around differences in offline-picking. These additional data and more sophisticated algorithms certainly do have an additional price. Warehouse Management Systems having these features from the beginning will be more expensive. Those not having these features will probably never reach a satisfactory performance with respect to the customer's requirements, no matter how many changes have been implemented.

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Let’s suppose, as a customer, we were lucky to have selected the right supplier with a suitable solution but we still require additional time and staff once a problem with differences does occur: though the system will handle them in a satisfactory way, we still need to perform inventories on the locations where the problems have encountered. Let us guess that in .3% of the picks in a distribution center a difference will occur. The action to manually correct stocks will possibly take 15 minutes. It is realistic to assume that other pick lists will be affected by a blocked location and the effects of putting aside other picks may easily consume another 15 minutes. If we assume that in a larger facility about 10,000 picks are performed per day, this will result in 30 cases per day, i.e. 15 hours additional time. This means that 2 additional persons are needed, and, for example, within a staff of 50 this sums up to a 4% cost increase. In other words, 2 employees per year will easily sum up to $ 50,000.

Compared to the cost of a radio or infrared communication system of approximately $ 50,000 to $ 150,000 depending on the area to be covered, the offline solution can, in the end, be more expensive than the online one, especially considering yearly additional cost spent on operations. In the best-case scenario, you should achieve a return of investment within a year’s period. This is only true if you have an adequate system, which may already cost some $ 30,000 more than an ordinary one. Thus, the real figures may even better serve as a good reason for online data capture.

By the way, there are more technical solutions for offline picking, e.g. data terminals that are used for display of order lines and data capture of pick results. On arrival at a plug-in station, data are exchanged between the WMS and the data terminal. Generally, the same problem as the one with pick lists could occur. As a customer, you would have higher costs for the same result. There is one way out of this problem: if all data terminals are synchronized with the exact time, and transfer a time stamp together with the pick or replenishment acknowledgment, the WMS could reconstruct the original sequence of transactions. But then the WMS software would have to collect all acknowledgments between the point of time the pick orders were transferred to the terminals and the last one being re-transferred to the WMS.

Only then a stock update could be performed. This solution would need additional routines and algorithms, and thus be more expensive, too. On top of that we would, in this case, have a time lag between discovering the difference and the clarification that could also affect a delay in picking and thus cause additional cost in operations.

In conclusion, in most cases, online communication is the better solution and in the long run less expensive than offline solutions. Especially in considering wireless LANs we may expect that in the next couple of years costs will decrease considerably. This is one more good reason for online communication.