Pick-to-Light in a hybrid order picking process

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The quest for the optimal combination of order picking techniques

In most warehouse operations a small number of SKUs will account for the vast majority of picking activities. That's what's known as the Pareto principle: ***20%*** *of the items account for* ***80%*** *of order lines.* ***Is it logical that these 20% fast-moving articles are handled in the same way as that other 80%?*** *In many warehouses, it has its benefits to use a special order picking technique for the group of fast movers: Pick-to-Light.*

Content

Pick by Paper | Pick by PDA | Pick by Voice | Pick-to-Light

Hybrid Picking Solutions

The world of logistics is a complex and dynamic place in which there is rarely a ‘one size fits all’ solution. Progressive companies are not afraid to deploy multiple integrated solutions within their logistics network to achieve the most efficient distribution model possible.

One area where this sort of diversification can unlock huge potential, but is often overlooked, is within order assembly. Using the same picking tool for every SKU within an operation, regardless of volume or order frequency can be extremely inefficient, causing savings that are generated in one area of the operation have to be re-invested elsewhere in order to achieve the desired throughput.

Traditionally, paper picking has been the standard warehouse tool for order assembly. Paper, however, is manual, cumbersome, prone to error and in many operations, highly inefficient. Organisations that look for an alternative often consider technologies such as voice or handheld computer picking, but rarely consider how much more effective solutions could be if coupled with another technology such as Pick – To – Light.

This paper aims to outline some of the key strengths and weaknesses of each of these technologies and how the deployment of hybrid solutions can help an organisation exploit the strengths of multiple systems, delivering a significantly increased benefit when compared to a ‘one size fits all’ solution.

Handheld Picking

In most handheld picking systems, each SKU is stored in a location with a fixed barcode and location number. An operator is equipped with a handled or body mounted computer device with an integrated scanner that is connected to the WMS (Warehouse Management System) via a Wi-Fi connection. Orders are then fed to the operator via the handheld which shows the operator which locations to visit for the products on that order. On reaching the location, the operator scans the barcode for verification and picks the required amount which he reads from the handheld display. Once picking is completed, the user confirms with the pick on the handheld and the next command is sent from the WMS.

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Voice Picking

As its name suggests, voice technology guides the picking process by 'talking' to an operator via the use of a headset and microphone and body mounted 'voice-box' which communicates back to the WMS via Wi-Fi. The voice system turns picking actions into voice commands that the operative responds to using pre-defined voice tags. When picking commences, the user is given a voice command which directs them to the first product location. On arrival, the operative reads a unique voice tag for that location for verification and then is told the quantity to pick from that location. The user then tells the system that the pick is completed and the next command is given.

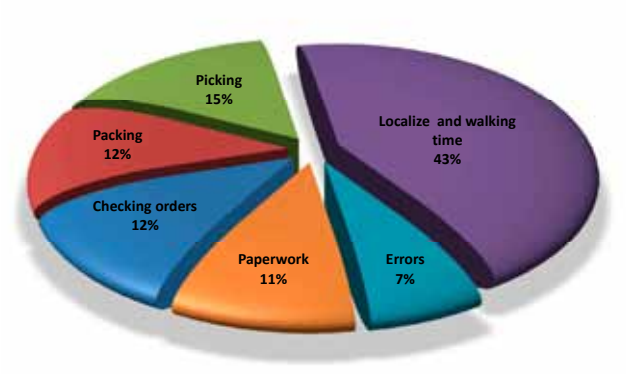
Pick – To – Light

In a Pick-to-Light operation, each SKU location has an LED display with an illuminated push button which is connected back to the WMS. When a user begins to pick an order, the WMS system lights up each of the SKUs that is required and shows the quantity to pick on the LED display. The operative can then see at a glance which products are required, confirming each pick by pushing the illuminated button and turning it out. When all products are picked, all lights will be off and the next order can begin.


DO IT RIGHT AT THE SPEED OF LIGHT
RF Barcodescanning
Voice Picking
Pick-to-Light

Speed

Paper picking time



This and the following pie-charts shows a time breakdown by pick technology. This first one shows the breakdown when using a paper based process and helps illustrate why it is difficult to achieve a high pick rate; because of all the time intensive tasks that are integral to the process.

Interestingly, we can see from this breakdown that in paper picking order fulfilment time only accounts for around 25% of an operative's total available time (picking items – 15% and preparing order for shipment – 12%). By far the most intensive process step is in searching for the correct pick location and the walking time that is associated with this task (43%). The remaining three categories are entirely value stripping; correcting errors (7%), checking orders (12 %) and process paperwork (11%).

Hand Held Picking: Elimination of Process Steps

Correctly deployed, picking via handheld can eliminate 3 categories of activities outlined above. Properly used, the technology makes it virtually impossible to pick from the wrong location as scanned confirmation steps confirm that the user is taking the correct product from the correct location and is given immediate feedback if the wrong product or location is selected.

This means pick mistakes can be avoided before they occur and the reduced risk of errors reduces the need for quality checking significantly. The removal of paper picking lists also means that administration time is eliminated and picking data is transferred directly back to the WMS without the need of collating written picking sheets.

Voice Picking

In addition to the benefits of pick by pick confirmation, voice offers further efficiencies by communicating direct with the operator using audible commands, and confirmation steps can be completed verbally. This means the user never needs to read a screen and their hands are always free, shaving more valuable seconds from the picking process.

Pick To Light

Pick-To-Light combines the benefits of voice and handheld picking and with the elimination of certain steps within the picking process, can prove to be even more efficient in certain applications. Pick-to-Light is a highly accurate picking method as product locations are clearly illuminated and the operative is required to physically visit the location and pick from it, making miss-picks a near impossibility.

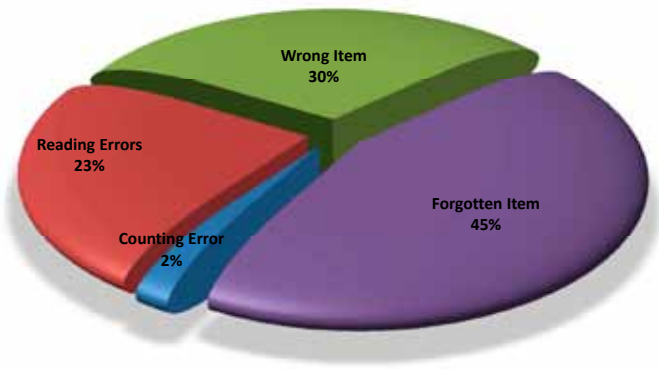
When using Pick-to-Light, another key advantage can be identified: the ability to 'think ahead'. Using most other picking technologies, operatives must wait for a command before proceeding. At a Pick-to-Light pick face, all required products can be seen at a glance meaning the user can move more intelligently and can always see the required picking quantities.

Possible Errors

While speed is an important criterion in the assessment of picking performance, it should never be considered in isolation. Accuracy is a vital aspect of any picking process, and mistakes not only cost valuable time and money in re-work and correction, they also have the potential to cause major problems further down the supply chain, or worse, directly impact the end customer. The graph opposite illustrates some of the most common types of errors made in a typical paper-based warehouse operation.

While incorrect reading, counting errors and picking from the wrong location are all commonplace, by far the most prevalent error is 'Item Missing' (45%). There can be many reasons that an operative fails to pick an item; the product was simply missed, the item was marked on paperwork but not physically assembled or the pick was not possible due to the fact the pick location was empty.

Paper Pick, picking errors



Eliminate Empty Pick Locations

A huge potential advantage of paperless picking technologies is the ability to eliminate empty pick locations. Using paper, 'out of stock' information can only be acted upon once the paperwork for a given pick has been collated and analysed, or some other manual method has been completed. Using a paperless system, each pick can be communicated directly back to the WMS, meaning active real-time control can be kept of stocking situations. In fact, stocks can be determined in advance, meaning an empty pick location becomes a thing of the past.

The end of incorrect parts

Errors due to order line skipping are reduced to zero in a paperless warehouse. The reason being that both RF Barcode scanning and Voice Picking are specifically designed to release the order lines in a fixed sequence line by line therefore making it impossible to skip any order lines. This is also the case with Pick-to-Light. The next order will only begin when all the lights of the previous order have been turned off. A pick light is turned off by hitting the acknowledge button, after the quantity displayed has been picked, confirming the pick.

Reading or picking errors are rare also in a paperless warehouse. When a warehouse employee with either RF Barcode scanning or Voice Picking misreads or misunderstood a pick location, the picker ends up in a place in the warehouse the system does not recognize.

The picker will be notified of this error immediately after scanning the (incorrect) location or reading out the (incorrect) check digit. When using Pick-to-Light the chance of pick at a wrong location is just as rare, with the added benefit of not needing to perform an additional check to find out the error. After all, the lit display doubles as validation of the correct pick location!

Pick location remains the focal point

In addition, with Pick-to-Light, we can almost entirely eliminate the small chance of picking errors. Employees, who look at their barcode scanner screen to get the correct number and having to put the unit away, still run the risk of picking the wrong location address when they look up again.

Pick-to-Light enables the employees to constantly keep their eyes on the correct pick location. Also with voice picking there is always a small chance that employees will pick from the wrong location. Consider the situation that the number of picking units is too large for an employee to pick in one movement and transfer them to a container. With each new hand movement it may happen that the employee will pick from the wrong location. Pick-To-Light will entirely eliminate that possibility. As the light at the pick location remains on and only switches off when the full number is picked and the button is pushed.

Various Order picking

The advantages and

Cost Reduction

In many environments, the deployment of paperless technology such as voice, handheld or Pick-to-Light, will result in a significant decrease in order processing times. This in turn will lead to higher rates of productivity and reduced errors providing huge potential to reduce costs significantly.

In the right application, we have seen that Pick-to-Light can offer the most potential benefits to an operation. Over other methodologies, Pick-to-Light provides the opportunity to remove valuable seconds from the assembly of each order line, which over an entire operation can amount to large reductions in required FTE.

Indirect and Hidden Costs

The relationship between error rates and costs can often be difficult to quantify. Many of the costs that arise as a result of a picking error are not always immediately visible and some, such as delays in invoicing and credit processing may not manifest themselves for days or even weeks after an error occurs. However, it cannot be disputed that errors are a drain on an organisations valuable resources. Put simply, picking errors fall into three key categories:

- Too few items were picked
- Too many items were picked
- Incorrect item/s picked

In the first case, as a bare minimum, additional administration costs will be incurred; the customer (be it internal or external) must be credited for the missing item and in many cases, additional delivery or shipping costs will be required to rectify the mistake. In the second case, the error is rarely reported and the additional item/s are either wasted (most common in short shelf life situations) or is kept by the customer as an additional benefit. In either scenario, product has

techniques.....

disadvantages regarding the costs

been lost and all associated production and shipping costs lost with it.
In the final case is often the one that has the largest impact. The incorrect item needs to be returned at the supplier's expense and further shipping costs in rectifying the error are also incurred. Add to this the additional administrative effort required and the impact on customer satisfaction and we can soon see how costly a simply error can really be.

Picking error cost

Not everyone agrees how much a picking error cost. For wholesalers and logistics service providers, estimates are between 6 and 40 euro per pick error. These costs can be higher as clients may have penalty clauses in their contracts regarding delivery reliability. Also think of the additional inspections and audits cost that dissatisfied customers may ask you to undergo. For retailers, the costs are often higher, because a pick error can directly result into "lost sales" as consumers take their money elsewhere.

Calculation example 1: cost of picking errors

A simple wholesale operation processes 20,000 order lines per day and achieves a respectable pick accuracy of 99.3%. If we assume that the average error costs the wholesaler €10 per occurrence (factoring in reconciliation, administration, transportation and lost production/assembly time) the approximate yearly cost will be approximately €357,000 per year without factoring the impact upon declining client satisfaction. If the deloyment of a paperless picking solutions improves the accuracy by 0.6%, then the annual error cost reduces to approximately €51,200 – producing a saving of over €300,000 per year and boosts client satisfaction as a result.

Potential Investment

All paperless picking solutions require investment to deploy – hardware, software and IT infrastructure all need to be properly considered in assessing the potential investment size of any solution. Each solution has a key cost driver that will go some way in determining the total investment size. In voice or handheld solutions, the driver is usually the number of users – each requires the appropriate hardware (either handheld or voice unit) in order to complete the picking task. In a Pick-to-Light installation however, it is the number of SKU locations, not the number of users that drives total investment. Essentially this means that in a high SKU, low frequency environment (where the number of picks are lower and thus the number of operatives required are smaller) then the total investment level for Pick-to-Light will usually be higher than a voice or handheld solution. However, a Pick-to-Light in a high frequency environment, with a lower number of SKU's but a very high pick frequency (where the number of order lines requires a large number of users to be active in a short period) then Pick-to-Light can often prove far more cost effective and will not require the same level of IT infrastructure costs associated with wireless networks and mobile computing technology.

Number of pickers vs. pick locations

Which order picking technique is more expensive, depends entirely on the situation. In RF barcode scanning and voice picking the number of order pickers is the key variable that determines the level of investment. For Pick-to-Light the number of pick locations determines the required investment. If we will use Pick-to-Light for all pick locations in a warehouse, it will be more expensive than RF barcode scanning or voice picking. If we limit the use of Pick-to-Light to pick locations that generate the most picks, the investment in displays remains limited while minimizing the number of barcode scanners or headsets. In this case, Pick-to-Light can be cheaper than any of the two other techniques.

Calculation Example 2: Voice Picking vs Pick-to-Light

		total number of locations								
		50	100	200	300	400	500	1000	2000	3000
Orderpickers	1	1.000	-1.500	-6.500	-11.500	-16.500	-21.500	-46.500	-96.500	-146.500
	2	4.500	2.000	-3.000	-8.000	-13.000	-18.000	-43.000	-93.000	-143.000
	3	8.000	5.500	500	-4.500	-9.500	-14.500	-39.500	-89.500	-139.500
	4	11.500	9.000	4.000	-1.000	-6.000.	-11.000	-36.000	-86.000	-136.000
	5	15.000	12.500	7.500	2.500	-2.500	-7.500	-32.500	-82.500	-132.500
	6	18.500	16.000	11.000	6.000	1.000	-4.000	-29.000	-79.000	-129.000
	7	22.000	19.500	14.500	9.500	4.500	-500	-25.500	-75.500	-125.500
	8	25.500	23.000	18.000	13.000	8.000	3.000	-22.000	-72.000	-122.000
	9	29.000	26.500	21.500	16.500	11.500	6.500	-18.500	-68.500	-118.500
	10	32.500	30.000	25.000	20.000	15.000	10.000	-15.000	-65.000	-115.000
	11	36.000	33.500	28.500	23.500	18.500	13.500	-11.500	-61.500	-111.500
	12	39.500	37.000	32.000	27.000	22.000	17.000	-8.000	-58.000	-108.800
	13	43.000	40.500	35.500	30.500	25.500	20.500	-4.500	-54.500	-104.500
	14	46.500	44.000	39.000	34.000	29.000	24.000	-1.000	-51.000	-101.00
	15	50.000	47.500	42.500	37.500	32.500	27.500	2.500	-47.500	-97.500
	16	53.500	51.000	46.000	41.000	36.000	31.000	6.000	-44.000	-94.000
	17	57.000	54.500	49.500	44.500	39.500	34.500	9.500	-40.500	-90.500
	18	60.500	58.000	53.000	48.000	43.000	38.000	13.000	-37.000	-87.000
	19	64.000	61.500	56.500	51.500	46.500	41.500	16.500	-33.500	-83.500
	20	67.500	65.000	60.000	55.000	50.000	45.000	20.000	-30.000	-80.000

This presents hardware cost comparison only. Differences are shown between the number of Voice-sets and displays (numbers are indicative)

67.500	This means that the Hardware of 50 displays requires about 67.500 less investments than 20 voice-headsets
-30.000	This means that the hardware of 2000 displays requires about 33.000 more investments than 20 voice-headsets

Operational Flexibility

Pick-to-Light installations are commonly believed to be inflexible sue to the fact that they are 'hard-coded' into an opration – they are installed in fixed locations and the perception is that this is far more difficult to change that a voice of handheld solution. The truth, however, is that modern Pick-to-Light are far more flexible than ever before. Displays can be added, removed and replaced with great ease using 'Plug and Play' technology.

Equally, Pick-to-Light installations make the matching of labour to volume a far easier task than their user-based counterparts: no additional hardware is required if volumes increase and more users are required, the same number of locations serves the operation regardless of the number of users.

Printing and Paper Costs

The cost saving of removing paper within an operation cannot be underestimated. Consumables such as printer cartridges and paper soon add up, and the price of printing is steadily on the increase. Add to this the cost of deprecation on printer hardware and there is soon a compelling case for the removal of paper based picking solutions.

20% OF THE SKU'S = 80% OF THE COSTS

Hybrid Picking Processes

Each of the technologies explored so far has a number of advantages, but the success of any depends on matching the solution to the situation. In many warehouse operations, there is not a single order or SKU profile that suits one solution perfectly. More commonly, the modern warehouse must cope with a range of ordering profiles and volume fluctuations that causes no one solution to be ultimately effective. And so, the Hybrid picking solution is born, utilising each technology in its niche and extracting maximum benefit in the operation.

Pick-to-Light for Fast Moving SKU's

Direct comparisons between warehouse picking technologies generally highlight the fact that Pick-to-Light can provide higher productivity with a higher rate of accuracy in many applications. However, this does not mean that it is the most effective technology to use across an entire warehouse operation. Pick-to-Light is the ideal solution for use in those parts of the warehouse operation where fast moving SKU's are found, where walking distance can be kept to a minimum and high speed picking can be achieved due to high order line frequency. In these high intensity picking areas, voice or handheld picking can be cumbersome and inefficient.

However, in areas of a picking operation when SKU's are picked infrequently and order lines are low, voice or handheld technology can produce better ROI results as Pick-to-Light can be cost prohibitive to install. Inevitably, this leads to a situation where maximum benefit can be extracted by utilising the speed and efficiency of Pick-to-Light in a fast moving area and the relative ease and lower cost of deployment of voice or handheld picking in slow moving areas.

Hybrid Design

The key to designing an effective Hybrid process lies in identifying the processes and areas where fast moving activity takes place. This 'class based' approach begins with intelligent SKU analysis, and the construction of appropriate processes for each class of SKU.

The table below depicts the typical 'tipping points' at which voice becomes more lucrative to deploy when compared to light. Comparing the number of picks per hour with the number of picking locations, the crossover line illustrates that in nearly all 'high intensity' pick environments (where there are a high number of picks per hour coupled with a high number of SKUs) that light will prove a more attractive option than voice. To make this case stronger, adding a handheld picking element to a light system that will handle slow moving SKUs will in many cases generated an immediate ROI.

Calculation example 3: Net present value pick-intensity

		Total amount of locations												
Total amount of picks per hour		50	100	150	200	250	300	350	400	450	500	1000	2000	3000
	50	-8.978	-11.728	-14.478	-17.228	-19.978	-22.728	-25.478	-28.228	-30.978	-33.728	-61.228	-116.228	-171.228
	100	-207	-2.957	-5.707	-8.457	-11.207	-13.957	-16.707	-19.457	-22.207	-24.957	-52.457	-107.457	-162.457
	150	8.565	5.815	3.065	315	-2.435	-5.185	-7.935	-10.685	-13.435	-16.185	-43.685	-98.685	-153.685
	200	17.336	14.586	11.836	9.086	6.336	3.586	836	-1.914	-4.664	-7.414	-34.914	-89.914	-144.914
	250	26.108	23.358	20.608	17.858	15.108	12.358	9.608	6.858	4.108	1.358	-26.142	-81.142	-136.142
	300	34.879	32.129	29.379	26.629	23.879	21.129	18.379	15.629	12.879	10.129	-17.371	-72.371	-127.371
	350	43.651	40.901	38.151	35.401	32.651	29.901	27.151	24.401	21.651	18.901	-8.599	-63.599	-118.599
	400	52.422	49.672	46.922	44.172	41.422	38.672	35.922	33.172	30.422	27.672	172	-54.828	-109.828
	450	61.194	58.444	55.694	52.944	50.194	47.444	44.694	41.944	39.194	36.444	8.944	-46.056	-101.056
	500	69.965	67.215	64.465	61.715	58.965	56.215	53.465	50.715	47.965	45.215	17.715	-37.285	-92.285
	550	78.737	75.987	73.237	70.487	67.737	64.987	62.237	59.487	56.737	53.987	26.487	-28.513	-83.513
	600	87.508	84.758	82.008	79.258	76.508	73.758	71.008	68.258	65.508	62.758	35.258	-19.742	-74.742
	650	96.280	93.530	90.780	88.030	85.280	82.530	79.780	77.030	74.280	71.530	44.030	-10.970	-65.970
	700	105.051	102.301	99.551	96.801	94.051	91.301	88.551	85.801	83.051	80.301	52.801	-2.199	-57.199
	750	113.823	111.073	108.323	105.573	102.823	100.073	97.323	94.573	91.823	89.073	61.573	6.573	-48.427
	800	122.594	119.844	117.094	114.344	111.594	108.844	106.094	103.344	100.594	97.844	70.344	15.344	-39.656
	850	131.366	128.616	125.866	123.116	120.366	117.616	114.866	112.116	109.366	106.616	79.116	24.116	-30.884
	900	140.137	137.387	134.637	131.887	129.137	126.387	123.637	120.887	118.137	115.387	87.887	32.887	-22.113
	950	148.909	146.159	143.409	140.659	137.909	135.159	132.409	129.659	126.909	124.159	96.659	41.659	-13.341
	1000	157.680	154.930	152.180	149.430	146.680	143.930	141.180	138.430	135.680	132.930	105.430	50.430	-4.570

Average net present value difference in Euro between Voice picking and Pick to Light

157.680	This means that in 3 years time the net present value of the investments and savings with Lights in on average 57.680 Euro higher then with Voice
-171.228	This means that in 3 years time the net present value of the investments and savings with Voice is 171.228 Euro higher than with Lights

Consolidation and shipping

Implementation of a hybrid picking process also has implications for other activities in the warehouse. You may think of preparing orders. These orders are now picked in different zones by numerous picking staff. Ultimately, we only want one shipment being sent to the customer. That means that somewhere in the overall process, picked products from different areas must be consolidated. Consolidating orders can be done in different ways:

- It takes place at the end of the process i.e. at the shipping department. Warehouses that have zone picking established, implementation of Pick-to-Light will hardly have any additional consequences when consolidating is done at the shipping department. Whether we are combining products originating from two voice picking zones or products that originate from one voice picking and one Pick-to-Light zone does not matter after all.
- We can also consolidate orders using relay picking. The box or container that is used to put the order in is simply passed on from one area to another. At first the box or container passes through the voice picking area after which the Pick-to-Light area will complete the order. This way we can avoid a separate consolidation process. Besides, this way we make the most efficient use of container space.

Regardless of consolidation method used, in many cases it leads to little or no additional effort and additional costs.

Phased Implementation

In warehouses operations that still rely upon paper systems, a hybrid solution can be deployed in phases to minimise operational impact. In many cases it is best to implement a Pick-to-Light process first, and then move the rest of the operation to an alternative solution. There are several reasons that this is the case, the two key points are:

- A Pick-to-Light solution focuses on fast moving articles with the highest pick intensity. Starting with Pick-to-Light will yield the largest productivity gains from the outset, underpinning future investment as required.
- Implementing voice- or handheld computer picking initially often means that fast moving SKU's will also be picked using this technique in the first instance. This approach inevitably means that less initial benefit can be extracted and will cause the pick process to be re-aligned in two phases making the project management process much more complex.

A Hybrid solution is also worth serious consideration in operations that already operate using a paperless solution. There is increasing pressure for suppliers to operate at lower inventory levels and with shorter lead times which in turn results in significant changes to order patterns. Customers order more frequently, but in smaller quantities. This results in a higher number of picks in the warehouse and as a result makes the Pick-to-Light proposition more attractive.

References

Pcdata – Pick-to-Light Made Easy

Building on years of experience in deploying order assembly systems, Pcdata have developed a Pick-to-Light display system that is low cost, easy to install and extremely flexible. Having worked in some of the most dynamic and demanding supply chain environments, we understand the importance of systems design and build our solutions to enable, not restrict your growth.

If a display has to be moved,
it has only to be clicked from the pro
file and clicked into the profile on
somewhere else. ***That is all.***
The click and go principle.

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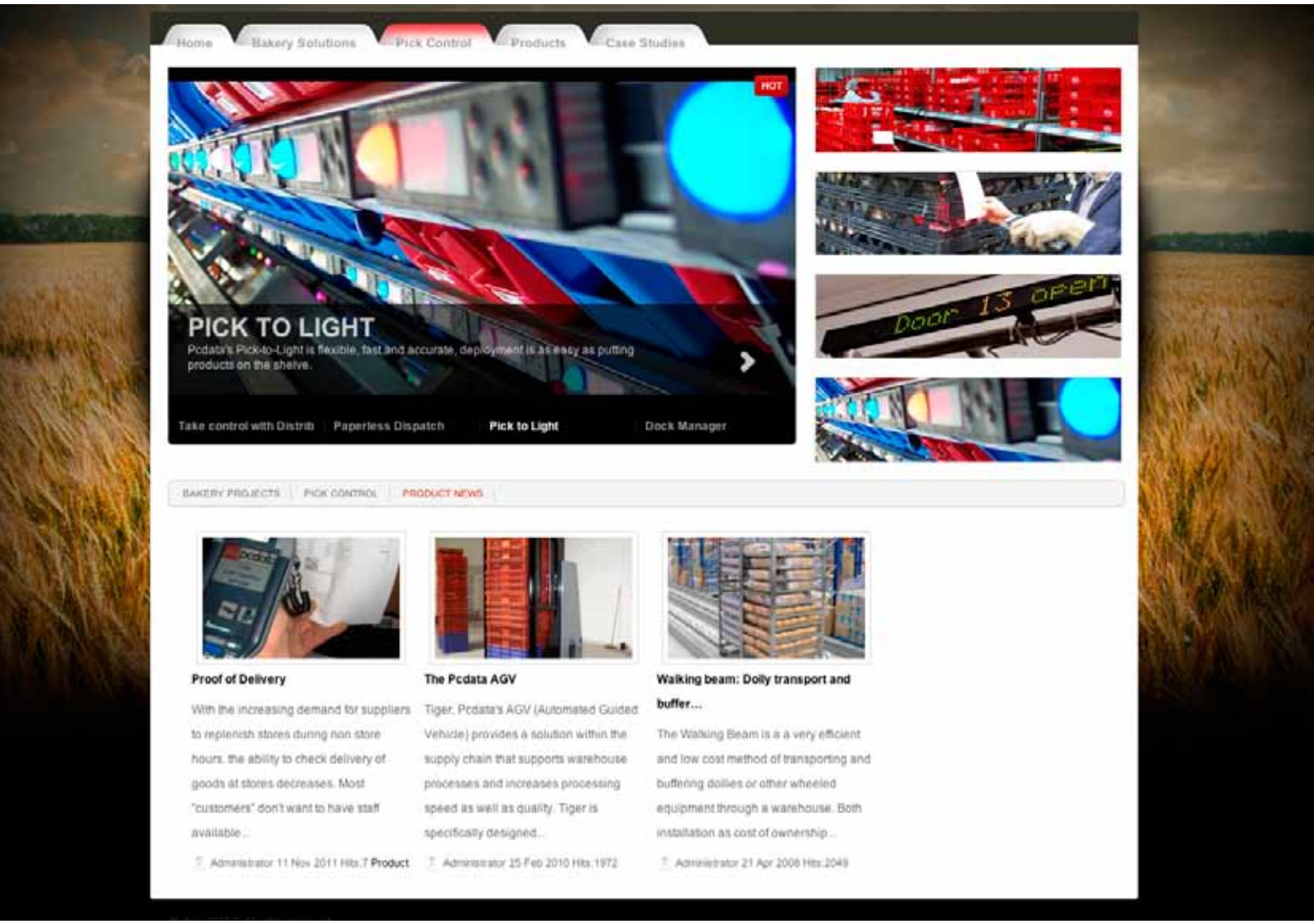

We are happy to study your

logistical data

and then make an on data based statement about your

order picking strategy ....

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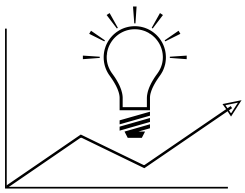
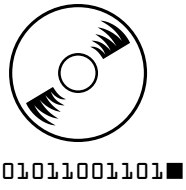
Brain-ware



Software



Hardware