Using Inventory Classification to Reduce Stock and Improve Service Levels

An EazyStock Guide to Optimized Inventory Management

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The Need for ABC Analysis

As businesses try to compete in a marketplace that demands variety and choice, they're increasingly offering a wider range of products. And while product choice is great for customers, it quickly becomes a major headache for the teams who need to manage a growing density of SKUs!

Some challenges are arguably obvious to predict. For example, an expanding product range will often require more warehouse space and more resources to order, receive, pick and pack the goods.

But it's easy to overlook the impact that inventory variety can have on a firm's finances. By investing more working capital in inventory, many businesses will see an impact on their balance sheet. In addition, they will have less money to invest elsewhere in the business such as growth plans, personnel or automation.

So is there a way for finance managers to agree to grow their product portfolio without seeing a working capital shortfall? The answer lies in inventory analysis and classification.

In this white paper we'll provide an overview of ABC and XYZ analysis and how these frameworks can be used to classify warehouse items by their value to your business. We'll then discuss how inventory optimization software can automate this process and how the resulting data can be used to set stock levels, safety stock parameters and make product availability (service level) decisions.

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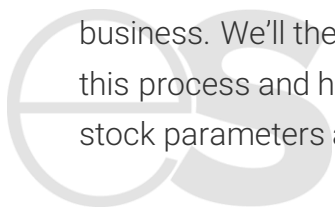
A Quick Overview of ABC Analysis

ABC analysis can be used to categorize SKUs into three categories based on how much value they bring to your business.

A   classification items are very important and sometimes business critical. These typically have a high value or are sold in large volumes.

B   classification items are important, but less important than 'A' items and more important than 'C' items. These are typically mid-range in inventory value.

C   classification items are marginally important. Typically, they have a low inventory value.

'Value' can be defined using a range of criteria such as annual sales revenue, profitability or annual consumption value.

ABC analysis is based on the theory that not all inventory is of equal value. Instead it follows the Pareto Principle where 20% of stock accounts for 80% of the value to the business and the other 80% of stock accounts for only 20%, as shown in this diagram.
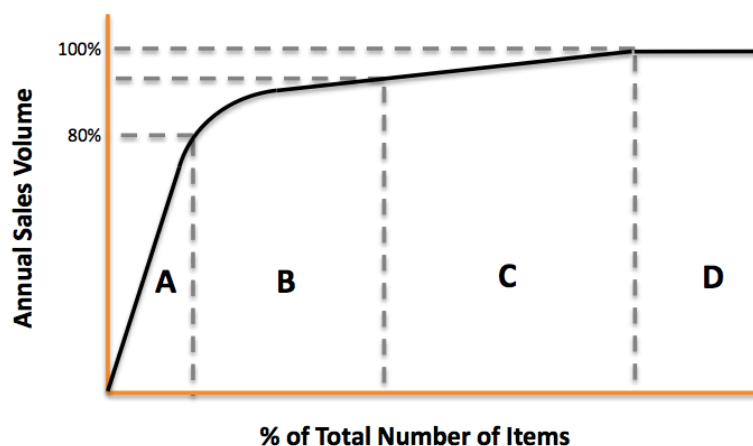
Diagram: ABC Categorization

Following the Pareto Principle in the working example below for Frank's Fasteners, you'll see that 79% of the inventory are A items, 15% are B and 6% are C. However, every business will have a unique make up of stock. The key is to set the categories where there are obvious jumps in the data. Read our blog for more information on how to calculate for ABC classification.

	Item	Annual Number of Units Sold	Cost per Unit	Annual Consumption Value	% of Annual Units Sold	% of Annual Consumption Value
79%	Tape measure	50,000	$3.50	$175,000	13.3%	54.2%
	Carabiner	40,000	$2.00	$80,000	10.6%	24.8%
15%	Eyebolt	16,000	$1.50	$24,000	4.2%	7.4%
	Ferrule	10,000	$1.50	$15,000	2.7%	4.6%
	Machine screw	21,000	$0.50	$10,500	5.6%	3.2%
6%	Flat washer	120,000	$0.05	$6,000	31.8%	1.9%
	Cable clamp	10,000	$0.50	$5,000	2.7%	1.5%
	S hook	15,000	$0.25	$3,750	4.0%	1.2%
	Wing nut	80,000	$0.03	$2,400	21.2%	0.7%
	Nail	15,000	$0.10	$1,500	4.0%	0.5%
	Total	377,000		$323,150		

Table: Example of products broken down into ABC categories

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The Application of ABC Analysis

ABC analysis can help you identify which items in your warehouse are the most important and should therefore consume most of your time in terms of inventory control and management.

Best practice is to focus on your category A items as these bring the most value to your business and therefore deserve the most attention! This could include reviewing and updating their demand forecast more frequently to guarantee stock availability or interacting more regularly with suppliers to improve lead times regarding these items.

ABC analysis can also help you work out appropriate inventory rules for each category.

If you're currently treating all stock items the same in terms of the quantities you hold and the purchases you make, you most likely have inefficient inventory policies and you're probably over- and under-ordering on many product lines. ABC classification will help you to set different service levels, safety stock levels and re-ordering parameters for each category. Then you can prioritize the management of the SKUs based on their category classification.

For example, you may want to focus on improving the service levels of your A class products over your Bs and Cs by increasing your safety stock levels to avoid stockouts.

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XYZ Analysis

ABC analysis is a relatively easy way to segment your inventory for effective management and control, but it does have its limitations. One problem is that the framework is very one-dimensional; you can only group items based on one criterion.

In addition, with only three categories, ABC analysis lacks granularity. With hundreds or even thousands of items in one segment, it's a big generalization to suggest that all SKUs even within the same category have the same characteristics and should be treated equally.

To help overcome these restrictions, it's you can add XYZ analysis. XYZ analysis classifies products based on their variability of demand.

X items have regular demand

Y items have strong variability in demand

Z items have very irregular and difficult to predict demand

This means you can segment items based on their forecastability (the likelihood that their demand will vary from their forecast).
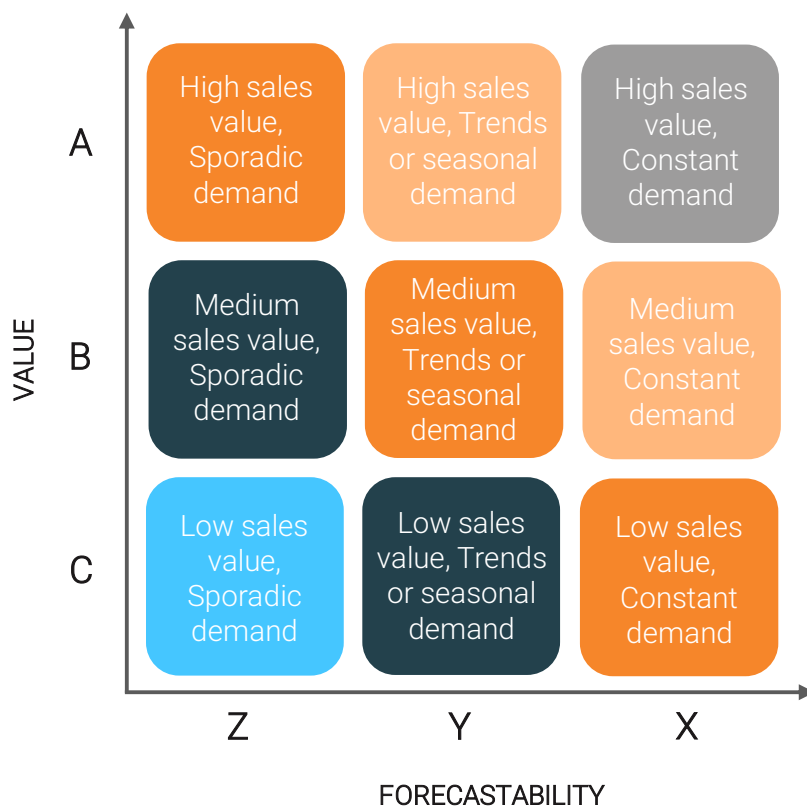
How to Calculate XYZ Analysis

The variability of demand for an inventory item can be expressed as the coefficient of variation. To categorize your products into X, Y and Z you need to:

- Identify the items you want to include in the analysis.
- Calculate the coefficient of variation for each item with the calculation:
    (standard deviation / mean) * 100.
- Sort the items by increasing coefficient of variation and accumulate the figures.
- Set the boundaries for each category.

It's important to make sure that you set an appropriate time span for assessing demand volatility. For example, if you have items with seasonal demand, it makes sense to include 12 months of data.

With your ABC and XYZ categories identified, you can produce a matrix similar to the one below and assign each group.

	Z	Y	X
A	High sales value, Sporadic demand	High sales value, Trends or seasonal demand	High sales value, Constant demand
B	Medium sales value, Sporadic demand	Medium sales value, Trends or seasonal demand	Medium sales value, Constant demand
C	Low sales value, Sporadic demand	Low sales value, Trends or seasonal demand	Low sales value, Constant demand

VALUE

FORECASTABILITY

The Benefits of ABC-XYZ Analysis

Adding another level of insight to your inventory classification allows you to make more informed ordering and stocking decisions. For example, it makes sense to treat AX items, that have a constant demand, differently to those with erratic demand (AZ items). If demand is steady and easy to predict (X items), your safety stock levels can be much lower than products where demand is much more volatile (Z items).

You could also focus less forecasting resources on BX products (with constant demand) than those with sporadic demand (BZ), as they should be easier to predict and the risk of excess or obsolete stock is lower due to consistent sales.

How Inventory Optimization Software Improves Inventory Classification

ABC-XYZ analysis is used by a number of Enterprise Resource Planning (ERP) systems to categorize stock and set inventory policies. But to take inventory classification to the next level, you need an [inventory optimization add-on](#) like EazyStock. Advanced inventory optimization software will analyze every SKU across your business against a multi-dimensional set of criteria. This can include:

Demand volume – number of units sold over the set period

This is the most common way of doing ABC classification: separating high and low volume products. It doesn't, however, make allowance for individual customer requests (number of picks) or the cost price of the products being sold (value of annual usage).

This is useful if your product range has similar unit costs and your customer base typically buys in a regular way (for example you sell only to retailers or only to wholesalers). This is less useful when you have products with a range of unit costs or a mixed customer base.

Sales frequency – what % of historical periods had a sale

This is important when you want to ensure demand with a certain level of consistency across a specific time period. Frequency is often analyzed over a different time period to the other dimensions. For example, if you have very short supplier lead times you might want to assess how many times you've had requests for particular products within a three-month period.

Number of picks – number of times items are picked over the set period

This accounts for the number of unique customer requests over a time period. This allows you to separate high volume products with many requests (1000 requests for 1 unit) vs. high volume products with low requests (2 requests for 500 units). Isolating by the number of customer requests is very important when you have a mixed customer base.

Value of annual usage – sales volume x unit cost over the set period

This takes sales into account as well as making allowances for how much each product costs per unit. This distinction is very important when you have products with a range of unit costs.

With inventory optimization software the result is a far more advanced and accurate inventory classification matrix that allows you to set tighter and more accurate inventory policies.

Here's how it works:

The example below shows an inventory policy matrix using Value of Annual Usage and Pick Frequency. Based on the data, EazyStock has recommended which items should be stocked (boxes in blue) and those which should be ordered on demand (boxes in white).
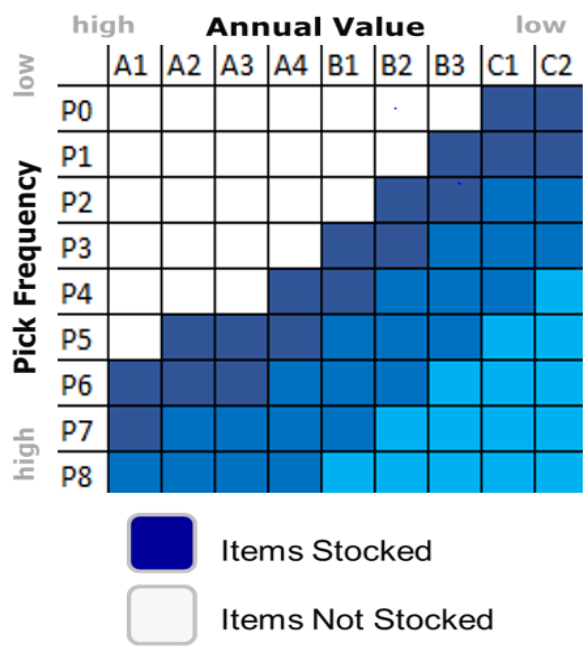
Adding pick frequency allows you to distinguish between a valuable category A product that sells once a year (A1 / P1) and one that sells 1000s of times (A1 / P8). By understanding how often a product is requested, EazyStock will then offer more informed inventory management decisions (see page 17).

For example, in the chart above, the system recommends that valuable, fast moving A1 / P8 items that sell consistently should be stocked to a high density while A1 / P1 items that sell very rarely should not be stocked at all. EazyStock therefore segments down the ABC categories to a more granular level so more accurate inventory policy decisions can be made.

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Taking XYZ Analysis to Another Level

In the previous chart it appears that demand variability (the XYZ factor) has been overlooked – far from it. EazyStock takes XYZ analysis to another level by analyzing the demand volatility of every SKU and assigning them one of nine demand types.

Every product in your warehouse has a specific demand pattern that makes it easier or more complex to forecast (its forecastability). EazyStock groups items into one of the nine demand types below based on their historical sales pattern.
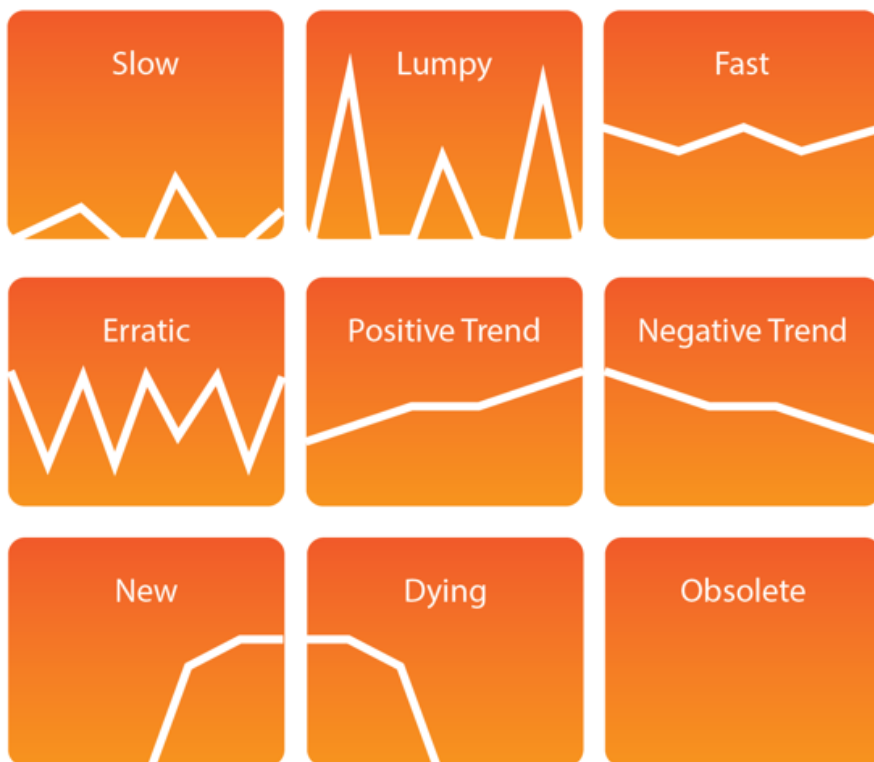
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Despite looking very different, some of these demand types have similar demand volatility behavior in terms of how easy their demand is to forecast. For this reason EazyStock groups them into three categories similar but more sophisticated in their calculations to the XYZ framework.

1. Normal

Fast

Erratic

Positive Trend

Negative Trend

2. Slow

Slow
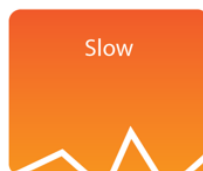
3. Lumpy

Lumpy

These demand types are automatically taken into account when classifying inventory in EazyStock and are used to segment the inventory policy matrix down further from 81 to 243 groups.

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In the matrix below you can see eight pick classes on the left-hand side, then the associated number of picks. Across the top the items are classified by their value of annual usage (VAU). Each segment is then broken down further by demand type: normal, lumpy and slow.

Pick class		DG	A1	A2	A3	B1	B1	B3	C1	C2	C3
P0	0	N									
		L									
		S									
P1	1	N									
		L									
		S									
P2	3	N									
		L									
		S									
P3	5	N									
		L									
		S									
P4	7	N									
		L									
		S									
P5	10	N									
		L									
		S									
P6	15	N									
		L									
		S									
P7	24	N									
		L									
		S									
P8	47	N									
		L									
		S									

Diagram: Example of an EazyStock Inventory Matrix

Including demand variability adds another level of inventory classification. For example, products with a lumpy demand are inherently more risky, as sales occur intermittently and sales volumes vary. So when you do get demand, its size could be within a wide range of possible values. This means you require more safety stock to cover for the demand variability in order to achieve a high service level.

As more safety stock means proportionally more invested capital compared to the other demand types, companies would typically go for lower service levels across the matrix on lumpy products in order to keep their capital free to invest in more regular items. However, there are always exceptions to this rule; for example if the lumpy product is business critical (category A) you may aim for a higher service level in spite of the cost.

Reducing Stock While Improving Service Levels

If you carry out an ABC analysis manually your next step would be to review and set your inventory policies based on the results. And this is exactly how EazyStock works.

With all items now categorized in to 243 segments, EazyStock then recommends service levels that you should achieve to optimize your operational performance.

A service level is the probability of not having a stockout. So a 99% service level means there's a 99% chance that you'll have a product in stock when a customer orders it.

For example, in the inventory policy matrix below the service levels could be set as follows:

Light Blue – 99%

Blue – 95%

Dark Blue – 90%

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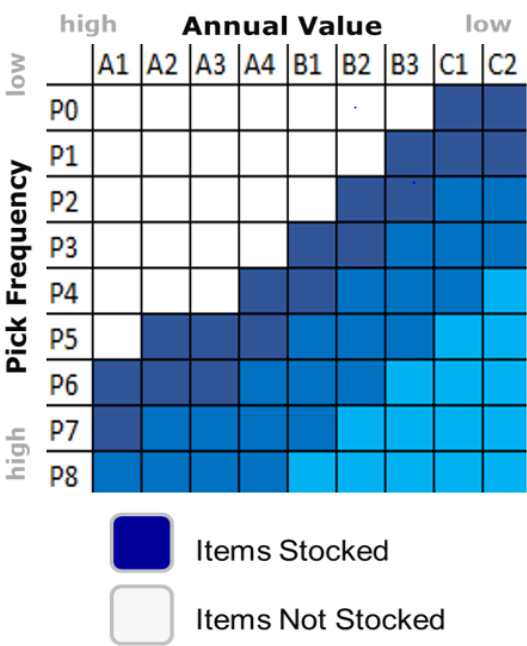
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In the EazyStock system the inventory policy matrix would look similar to this:

Picks class	DG	A1	A2	A3	A4	B1	B2	B3	C1	C2	
PO	0	N 94.00%	95.00%	96.00%	96.50%	97.00%	97.50%	98.00%	98.50%	99.00%	ⓘ
		L 70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	
		S 90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	ⓘ
P1	1	N 94.00%	95.00%	96.00%	96.50%	97.00%	97.50%	97.10%	80.00%	99.45%	ⓘ
		L 70.00%	70.00%	70.00% ⓘ	70.00% ⓘ	70.00% ⓘ	70.00%	70.00%	70.00% ⓘ	98.40%	ⓘ
		S 90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	99.25% ⓘ	99.80%	ⓘ
P2	3	N 94.00%	9	96.00%	96.50%	97.00%	97.30%	97.00%	97.40%	99.40%	ⓘ
		L 70.00%	70.00	60.00%	60.00%	60.00%	70.00%	93.00%	95.00% ⓘ	99.00%	ⓘ
		S 90.00%	90.00	90.00%	90.00%	90.00%	90.00% ⓘ	97.50% ⓘ	99.25% ⓘ	99.95%	ⓘ
P3	5	N 94.00%	82.50							%	ⓘ
		L 70.00%	70.00							%	ⓘ
		S 90.00%	90.00							%	ⓘ
P4	7	N 94.00% ⓘ	95.00							%	ⓘ
		L 60.00% ⓘ	70.00								ⓘ
		S 90.00%	90.00								ⓘ
P5	10	N 92.50% ⓘ	95.00							%	ⓘ
		L 70.00%	70.00								ⓘ
		S 90.00%	90.00							%	ⓘ
P6	15	N 95.00% ⓘ	97.40							%	ⓘ
		L 70.00%	70.00							%	
		S 90.00% ⓘ	90.00								ⓘ
P7	24	N 97.80% ⓘ	99.45							%	ⓘ
		L 70.00%	70.00							%	
		S 99.90%	90.00							%	
P8	47	N 99.90% ⓘ	99.90% ⓘ	99.96% ⓘ	99.95% ⓘ	99.96% ⓘ	99.97% ⓘ	99.98% ⓘ	99.00%	99.99%	ⓘ
		L 70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	70.00%	
		S 90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	90.00%	

Inset (zoomed detail):

Picks class	DG		A1	A2
PO	0	N	94.00%	95.00%
		L	70.00%	70.00%
		S	90.00%	90.00%
P1	1	N	94.00%	95.00%
		L	70.00%	70.00%
		S	90.00%	90.00%

As you can see, EazyStock calculates the recommended service level for each category. It then recommends the minimum amount of inventory you need to carry to meet your required service levels. This is so you can reduce the levels of stock you hold but still ensure availability, particularly for products that are the most valuable and most frequently requested across your business.

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If required, service levels can also be overridden, for example if you know you need to keep an A1/P1 product in stock in case your best customer requests it, despite only doing so once a year.

It's also possible to simulate service level alterations. For example, if you wanted to understand the cost implications of increasing your service levels, EazyStock will simulate the results.

Producing Inventory Policies for Easier Management

In the same way that you would produce inventory policies to manage your ABC product categories, EazyStock calculates management rules for every SKU in the matrix to ensure you hit your service levels.

This includes setting safety stock levels and replenishment alerts, ultimately providing a list of items and quantities to reorder. You can then decide whether to review the orders (which you may do for valuable, slow moving items) or simply automate the process (which you may do for faster moving, low value items where the risk of excess stock is low).

Unlike manual inventory classification frameworks, EazyStock will continuously analyze your stock to ensure each SKU falls into the right category and is managed by the right inventory policy.

By managing by exception you can free up your time to make informed, strategic decisions, instead of wasting it 'number-crunching'.

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Summary

Stock the Right Products

For organizations looking to expand their product portfolio and carry a larger number of SKUs, the need to reduce inventory levels is critical to ensure operational efficiency and growth. To do this, businesses need to understand the make-up of their inventory and set policies that achieve high service levels (product availability) with the least amount of stock.

ABC analysis, while simplistic, is a useful framework to help businesses move away from a 'one-size-fits-all' approach to inventory management and begin to understand which products to stock and in what quantities.

Adding the further dimension of XYZ analysis allows classification decisions to be made based on demand volatility, as well as value, therefore improving the accuracy of inventory policies.

For a more sophisticated and automated approach, software such as EazyStock, may prove a valuable investment. With its ability to undertake more complex stock analysis and provide inventory policies at SKU level, businesses can benefit from much tighter and more accurate control.

EazyStock is designed to ensure businesses carry the right stock, in the right quantities, to meet demand. With leaner inventory levels, informed purchasing and faster order management processes, business can gain an advantage over their competitors. But the real win is their ability to free up working capital and improve their bottom line.
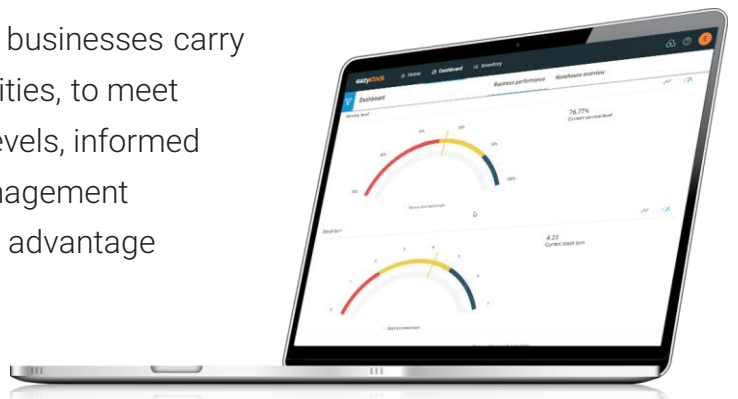
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