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International Fastener Expo

Beyond Lead Time and Usage

Sourcing Fasteners Globally Without Surprises – What Buyers Should Know



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What is this talk about?

1. **NOT AI** (mostly)
2. **Quantitatively** managing supply chain risk
3. Understanding the **limitations of an ERP / MRP**
4. Hacking a **simple system** to consider **multiple scenarios** in supply chain planning…
5. … in order to **increase inventory turns and fill rates**

All decisions balance risk; e.g. excess stock, stockouts, cost increases, etc

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10% cost increase: buy 1,000 now, or double to 2,000?

Every month, there is a 5% chance the customer stops buying.

250 units/month $10 now / $11 later 30% annual holding $4 liquidation/unit

Eight-month purchase plan	Normal buys	Double now
Current buy / sell-down if active	1,000 / 4 months	2,000 / 8 months
Extra price saving if demand holds	$0	$1,000
Holding cost if demand holds	$1,050	$2,000
Expected liquidation loss	$1,391	$2,407
Expected net cost with exit risk	**$18,959**	**$20,101**

Demand holds: $50 gain. With exit risk: about $1,140 more expected cost.

Net cost = purchases − recovery + holding. The normal plan reorders in month 5 only if the customer is still active.

Inventory planning tries to force fixed numbers onto a world of probabilities

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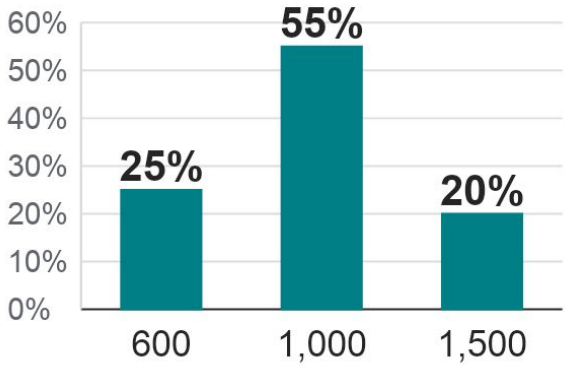
Cover demand during the system lead time

1,000
units per month

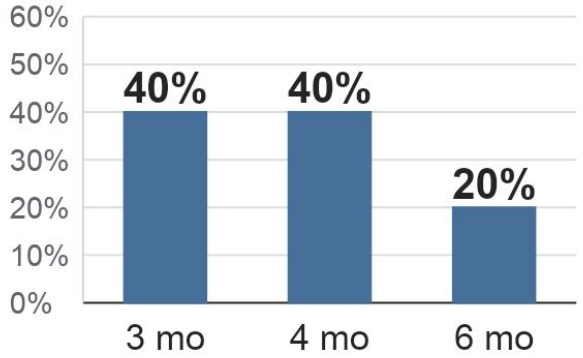
× 4 months
system lead time

4,000 units

Possible monthly demand



Possible lead time



The same averages can hide demand before arrival from 1,800 to 9,000 units.

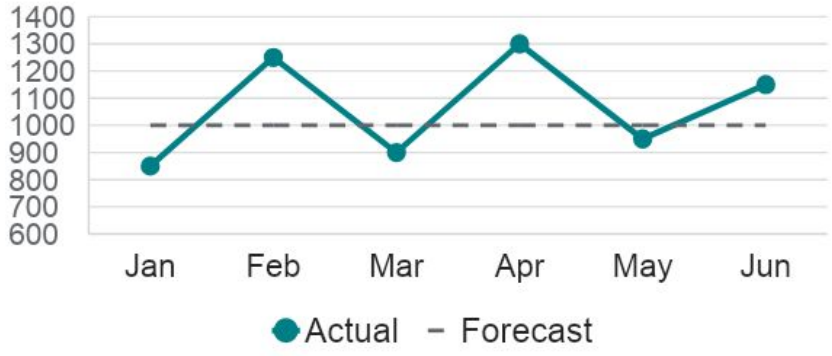
Illustrative distributions. The ERP point calculation is usage × lead time.

Standard forecasts are measured by mean error, which implies a 50% service target

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Traditional forecast accuracy

Score each month's actual minus forecast



Errors: −150, +250, −100, +300, −50, +150

RMSE ≈ 187 units/month

Error during the full lead time

Two error patterns. Both have monthly RMSE = 400 units.

−400, +400, −400, +400

Four-month error: 0 units

+400, +400, +400, +400

Four-month error: +1,600 units

Service depends on cumulative error over lead time. Monthly error can hide it.

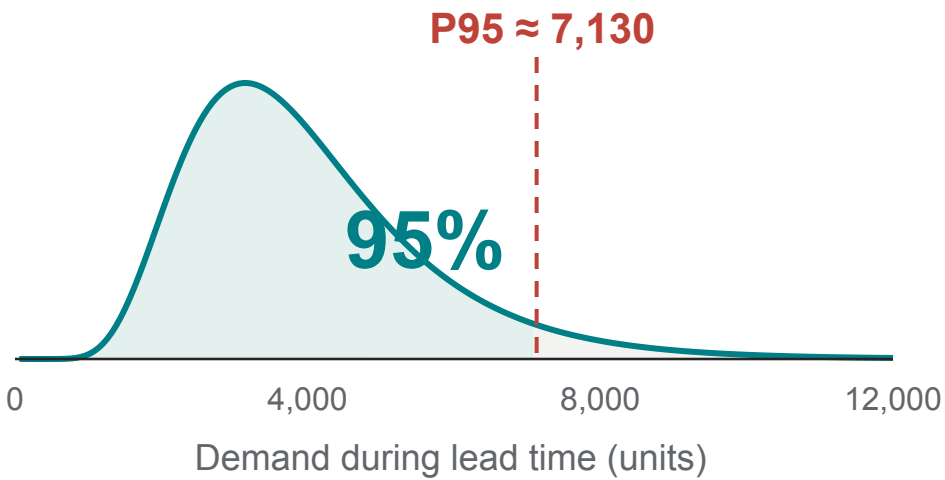
Cumulative error is the sum across the protection window. Include the review interval when ordering is periodic.

A probabilistic forecast evaluates every possible outcome weighted by likelihood

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A forecast shows how much demand could arrive, and how likely it is.

Four-month demand distribution



Likelihood of each outcome

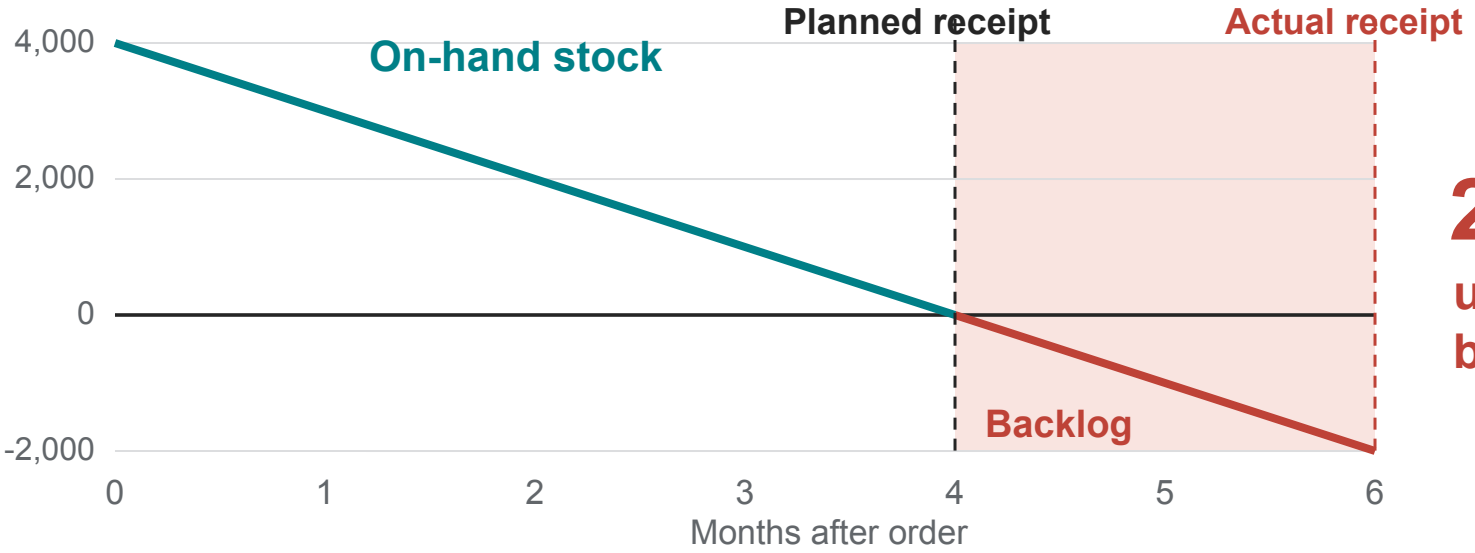
Total demand	Likelihood
0–2,000 units	6%
>2,000–4,000 units	52%
>4,000–6,000 units	31%
>6,000–7,130 units	6%
Above 7,130 units	5%

7,130 units cover 95% of the modeled demand outcomes over lead time.

Example distribution with mean 4,000 units. Probabilities rounded. Coverage probability differs from customer fill rate.

Accurate lead time forecasting is as important as demand forecasting

Perfect demand forecast: 1,000 units per month



2,000
units short by month 6

Lead time ends after production, transit, processing and QC make stock usable.

Illustrative. Negative values show backlog, not physical on-hand inventory.

Trust observed lead times for supplier fulfillment paths, not supplier promises

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Most ERPs use a manual number or this item's past receipts.

Use observations from groups of like items on the same fulfillment path.

Fulfillment path	Supplier states	Observed P50 / P90	What the group captures
Supplier-stocked	7 days	6 / 12 days	Stock availability and dispatch
Made to order	45 days	52 / 80 days	Production capacity and queue
Imported finished goods	90 days	110 / 165 days	Freight and customs clearance
Imported + local plating	120 days	145 / 210 days	Processing and QC release

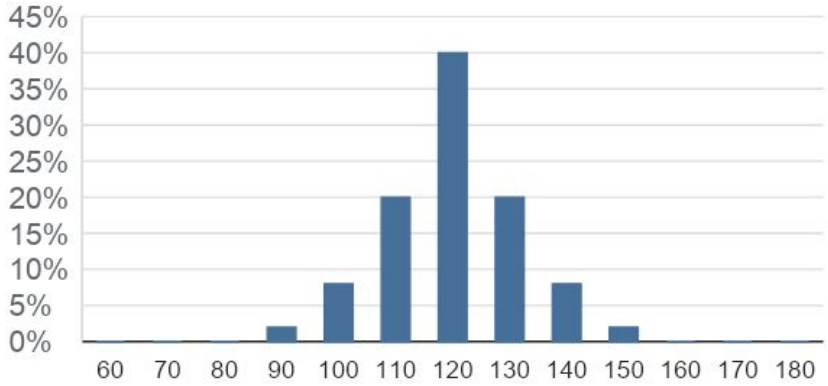
Late open PO: update its ETA. Future orders: update the relevant path forecast.

Illustrative lead times. A temporary disruption does not automatically justify permanently higher ERP settings.

Like demand, optimizing lead time requires a probabilistic approach

Supplier A: more consistent

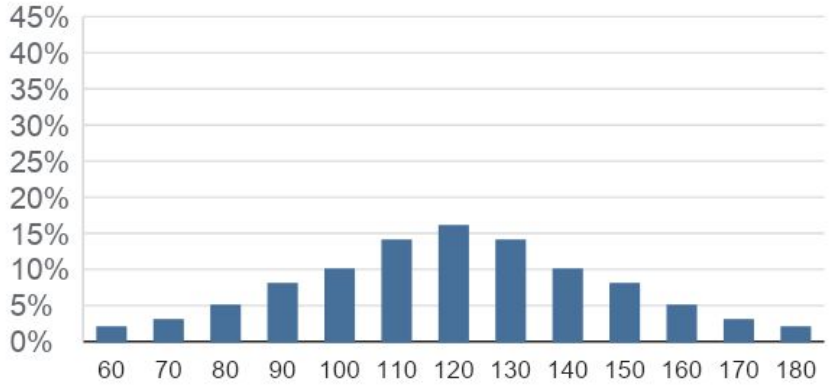
Mean 120 days



P90: 130 days / 300 safety units

Supplier B: less consistent

Mean 120 days



P90: 150 days / 900 safety units

At 90% protection, B needs 200% more safety stock despite the same average.

Illustrative. Receipt times in days. Demand is fixed at 30 units/day. Safety stock is the buffer above 120-day mean demand.

Combining accurate demand and lead time forecasts allow for optimal purchasing

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Monthly demand	4,000-unit reorder point — 70% service — $3,500 expected cost			6,000-unit reorder point — 90% service — $3,100 expected cost		
	2 months	4 months	6 months	2 months	4 months	6 months
500 units / mo	10% **+3,000** $3,000	10% **+2,000** $2,000	5% **+1,000** $1,000	10% **+5,000** $5,000	10% **+4,000** $4,000	5% **+3,000** $3,000
1,000 units / mo	10% **+2,000** $2,000	30% **Balanced** $0	10% **−2,000** $6,000	10% **+4,000** $4,000	30% **+2,000** $2,000	10% **Balanced** $0
1,500 units / mo	5% **+1,000** $1,000	10% **−2,000** $6,000	10% **−5,000** $15,000	5% **+3,000** $3,000	10% **Balanced** $0	10% **−3,000** $9,000

The 6,000-unit reorder point reduces expected risk cost by $400.

Cells: probability, extra (+) or short (−) units, and cost. Costs: $1 per extra unit, $3 per short unit.

Glossing over methodology weakness with safety stock e.g. std dev doesn't work

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Most ERPs patch one-number inputs with safety stock.

Fixed safety days

"Add 30 days"

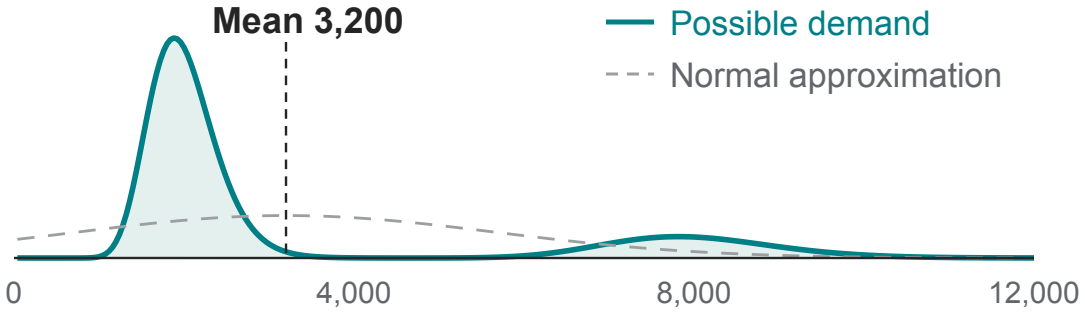
% of lead-time demand

"Add 20%"

Std dev of monthly demand

"Add 1.645 × σ"

Real demand can have a second peak from large orders



Normal 95% limit

7,260 units

15% of actual outcomes exceed it

Actual 95% limit: 8,630 units

The same mean and standard deviation can still hide very different tail risk.

Example demand pattern. The normal approximation uses the same mean and standard deviation as the actual distribution.

Holding cost should rise with commitment age to account for long-term risk

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Accelerating holding cost approximates demand loss, obsolescence and damage.

250/month, $10/unit, 2% bulk discount. Split: receive/pay 1,000 now + 1,000 in month 5.

Total purchase + holding cost

Purchase strategy	30% base cost	With risk allowance
Two separate 1,000 buys	$21,000	$21,146
2,000 received now	$21,560	$22,275
2,000 in two receipts	$20,580	$21,295

Holding: $1,000 normal / $1,960 full / $980 split.
Added risk: $146 normal / $715 bulk.

Split buy: remaining firm commitment

Month	Annual rate*	Avg firm units left	Added risk cost*
Month 1	30%	1,875	$0
Month 2	35%	1,625	$66
Month 3	40%	1,375	$112
Month 4	45%	1,125	$138
Month 5	50%	875	$143
Month 6	55%	625	$128
Month 7	60%	375	$92
Month 8	65%	125	$36

Split receipts save $420 on cash costs, but lose about $149 after long-term risk.

*30% on received/paid stock + an extra 5 percentage points per month on firm exposure. Age restarts with each separate buy.

So how do we implement these concepts in a simplistic ERP system (i.e. can we hack / fake it)?

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1 Group items by supplier fulfillment

“Like” means the same supplier and fulfillment path: stocked or made to order, origin, freight and processing.

2 Set the system lead time to a chosen quantile

Use this group’s order-to-usable-receipt history.
P75 = 120 days becomes the ERP lead time.

3 Forecast cumulative demand at that horizon

Rank historic rolling 120-day demand totals to estimate quantiles. New AI forecasting tools produce them natively.

From observations to settings

Lead-time outcome	Share received
Within 60 days	25%
Within 120 days	75%
Within 180 days	100%

Demand forecast over 120 days

Quantile	Total demand
P50	4,000 units
P90	6,000 units

Example scenario data. Correct demand for stockouts and seasonality. Pool comparable demand histories where item data is sparse.

A “zero safety stock” strategy combined with quantile forecasting can work around system limitations

4 Tune usage to achieve the combined service target

Test demand quantiles with the 4-month P75 lead time.
At P90: 6,000 ÷ 4 = 1,500 units/month for ERP usage.

Together, these settings cover 90% of the joint demand / receipt outcomes in this example.

ERP field	Setting
Lead time	120 days
Usage	1,500 / month
Safety stock	0 units
Reorder point	6,000 units

5 Set safety stock to zero

The buffer is already in the lead-time and usage settings.

6 Match the buying method to the decision

Routine replenishment

Use EOQ for a repeatable order quantity,
then apply MOQ, pack size and order cadence.

Bulk or incentive purchases

Compare quantities, discounts, receipt timing and risk.
EOQ rarely drives these choices.

EOQ uses mean demand. Compare incentive offers on total expected cost, including long-term commitment risk.

What gets better if we do this right? (I.e. What should we measure?)

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Illustrative performance dashboard

Service and customer cost

Metric	Current	Improved
In-stock: local	91%	**96%**
In-stock: network	95%	**98%**
Immediate fill: local	90%	**95%**
Immediate fill: network	94%	**97%**
Backorder days Median / P95	9 / 42	**4 / 20**

Inventory and economic cost

Metric	Current	Improved
Inventory turns	4.0×	**5.0×**
Stock >12 months	$18M	**$11M**
Liquidation loss / year	$2.4M	**$1.5M**
Emergency costs / year	$1.8M	**$950k**

Measure customer service alongside capital exposure and the cost of recovery.

Illustrative only. Compare identical definitions, periods and eligible locations. Track backorder frequency and units too.

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