Reduce errors and defects: the full report

Example: a medicine distributor in Manila, the Philippines, whose pharmacies complained of wrong items, wrong quantities and stock close to expiry. All six stages, from the guided tour.

The playbook at a glance

1. How often do errors happen, and what do they cost?
   8,200 defects per million opportunities, about 3.9 sigma: **Wrong item, including the wrong strength** is the largest type, and customers find most of the errors
2. Where in the process do errors start?
   Code typed in by hand at the shelf carries 54% of the errors on 14% of the order lines: 12.5% go wrong, against 1.2% on **Scanned at the shelf, checked at packing**
3. Why do errors happen there?
   3 of 5 suspected causes proven: **Shelf labels the scanner can't read**, **Look-alike strengths stored side by side** and **Overflow stock has no fixed place**, and 1 proposed fix to send back
4. How do you make the right way the easy way?
   Aisles 1 and 2: 14% before, 3% after, with 2 areas in a marked, known condition
5. Who owns the whole process, across every department?
   Head of operations owns the chain from **the pharmacy's order** to **the pharmacy's satisfaction**, measured by **DPMO from the order to the pharmacy**
6. How do errors keep falling after the project ends?
   The defect rate fell from 8,200 to 3,000 DPMO, with 5 suggestions answered in a median 2 days

STAGE 1 OF 6

How often do errors happen, and what do they cost?

Stage 1 diagnosis

8,200 defects per million opportunities, about 3.9 sigma: **Wrong item, including the wrong strength** is the largest type, and customers find most of the errors

The defect rate: **3,280 defects in 100,000 order lines, each with 4 chances to go wrong: 8,200 DPMO.**

As a sigma level: **About 3.9 sigma, using the usual 1.5 sigma drift allowance.**

By type: **Wrong item, including the wrong strength** is the largest, 41% of all defects, then **Wrong quantity** at 33%.

Who finds them: **Customers find 66% of the errors, before anyone inside does; the rest are caught inside the business.**

What they cost: **About PHP 2.95 million for the period, at PHP 900 an error.**

The counting: **Two people judging the same 200 order lines agreed on 97% of them.**

What this may mean

Many business processes run at three to four sigma, so this is common, not hopeless. Most errors reach customers before anyone inside spots them, which costs trust as well as rework.

Investigate next

In stage 2, find where in the process the errors start, from the records your systems keep: the path each order line took, and which paths carry the errors.

DPMO is defects divided by order lines times the chances to go wrong in each, times a million. The sigma level adds the usual 1.5 sigma drift allowance, as most published tables do; without it, the figure would be 1.5 lower.

Keep the definitions and the chances per order line fixed from now on, so next month's rate can be compared with this one.

The defect rate

COUNTED

3,280 defects in 100,000 order lines, September 2026

THE DEFECT RATE, SEPTEMBER 2026

DEFECTS PER MILLION OPPORTUNITIES (DPMO)

Defects ÷ (units × chances per unit) × 1,000,000

UNITS AND CHANCES

100,000 order lines, each with 4 chances to go wrong: wrong item, including the wrong strength, wrong quantity, stock within six months of expiry, damaged

THE RATE

3,280 ÷ (100,000 × 4) × 1,000,000 = **8,200 DPMO**

AS A SIGMA LEVEL

About **3.9 sigma**, using the usual 1.5 sigma drift allowance

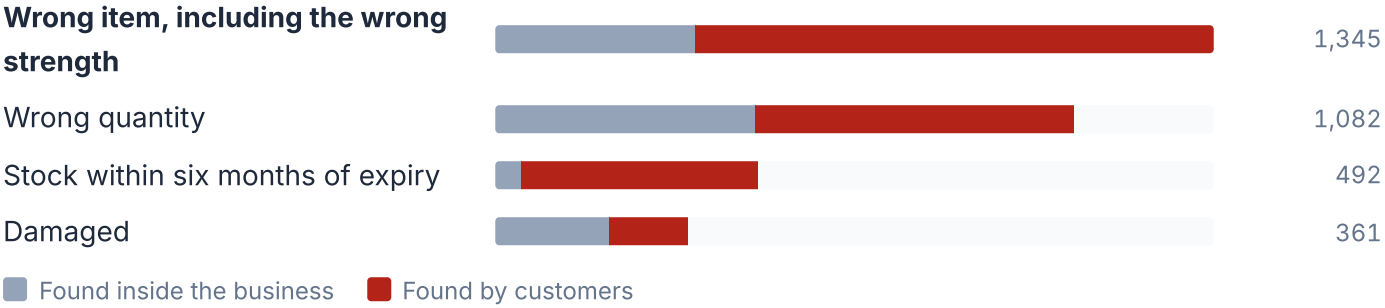
WHAT THE ERRORS COST

3,280 × PHP 900 = **PHP 2.95 million** for September 2026



Fewer defects to the right. The figure under each mark is its DPMO. Many business processes run at three to four sigma.

Defects by type, and who found them



DEFECT TYPE	COUNT	SHARE	FOUND BY CUSTOMERS	WHAT COUNTS
Wrong item, including the wrong strength	1,345	41%	72%	A product or strength on the delivery that is not the one on the order line
Wrong quantity	1,082	33%	55%	More or fewer packs delivered than the order line asked for
Stock within six months of expiry	492	15%	90%	Any pack delivered with less than six months to its expiry date
Damaged	361	11%	40%	A pack crushed, opened or wet on arrival, counted once per order line
All defects	**3,280**	**100%**	**66%**	

The highlighted row is the largest. Defects caught inside the business cost rework; those found by customers cost trust as well.

DECISION POINT

Take the rate to stage 2

8,200 DPMO. The largest type is wrong item, including the wrong strength. Keep the definitions fixed from now on. Next, find where in the process the errors start.

STAGE 2 OF 6

Where in the process do errors start?

Stage 2 diagnosis

Code typed in by hand at the shelf carries 54% of the errors on 14% of the order lines: 12.5% go wrong, against 1.2% on **Scanned at the shelf, checked at packing**

Overall: **326 of 10,000 order lines had an error: 3.3%.**

Code typed in by hand at the shelf: **14% of the order lines, 12.5% with an error, 54% of all errors.**

Scanned at the shelf, checked at packing: **79% of the order lines, 1.2% with an error, 29% of all errors (in the written procedure).**

Picked from the overflow area: **7% of the order lines, 8% with an error, 17% of all errors.**

Stage 1's defects: **90% of Wrong item, including the wrong strength is on Code typed in by hand at the shelf; 46% of Wrong quantity is on Code typed in by hand at the shelf.**

Steps linked to errors: **Code typed in by hand at the shelf: 12.5% of the order lines that went through it had an error, against 1.8% of the rest; 1 more step listed below.**

By Shift: **From 2.8% to 3.9% with an error: no value stands out.**

What this may mean

Your written procedure doesn't allow for it: it is a workaround, the kind everyone thinks too ordinary to mention. That is where to look for the cause.

Investigate next

In stage 3, list every cause people suspect for the errors on **Code typed in by hand at the shelf**, and test each one against the data before fixing anything.

A path is the sequence of steps an order line went through, in time order, with repeats in a row counted once. Activities marked as errors are not steps: they mark the order line as one with an error.

A step is linked to errors when the order lines that went through it go wrong at least 1.5 times as often as the rest.

Each path, its share of the work and of the errors

FROM

10,000 order lines, Jul 1, 2026 to Oct 2, 2026

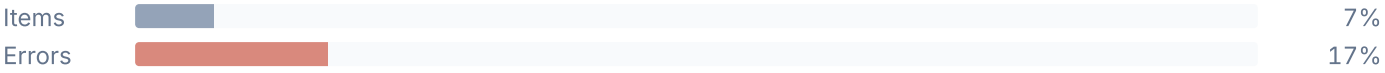
Scanned at the shelf, checked at packing In the written procedure



Code typed in by hand at the shelf



Picked from the overflow area



PATH	SHARE OF ITEMS	ITEMS WITH AN ERROR	SHARE OF ALL ERRORS	MAIN DEFECT
Scanned at the shelf, checked at packing (in the written procedure)	79%	1.2%	29%	Wrong quantity
Code typed in by hand at the shelf	14%	12.5%	54%	Wrong item, including the wrong strength
Picked from the overflow area	7%	8%	17%	Stock within six months of expiry
All 10,000 order lines	**100%**	**3.3%** (326)	**100%**	

A path is the steps an item went through, in time order. The highlighted path carries the most errors for its size.

Stage 1's defects, by path

STAGE 1 DEFECT	ORDER LINES WITH IT	THE PATH WITH MOST OF IT	ITS SHARE
Wrong item, including the wrong strength	137 (1.4%)	Code typed in by hand at the shelf	**90%**
Wrong quantity	76 (0.8%)	Code typed in by hand at the shelf	**46%**
Stock within six months of expiry	49 (0.5%)	Picked from the overflow area	**51%**
Damaged	37 (0.4%)	Code typed in by hand at the shelf	**46%**

For each defect type from stage 1, the path that carries most of it. Stage 3 starts from these.

Steps linked to errors

STEP	ITEMS THROUGH IT	WITH AN ERROR, THROUGH IT	WITH AN ERROR, THE REST
Code typed in by hand at the shelf	14%	**12.5%**	1.8%
Picked from the overflow area	7%	**8%**	2.9%

Items that went through the step, against those that didn't. Listed when the step's items go wrong at least 1.5 times as often.

By Shift



Share with an error for each value of Shift. The thin line marks all items together (3.3%). No value stands out.

DECISION POINT

Take Code typed in by hand at the shelf to stage 3

12.5% of its order lines go wrong, against 3.3% overall, and your written procedure doesn't allow for it: a workaround. Next, find out why, testing each suspected cause against the data before fixing anything.

STAGE 3 OF 6

Why do errors happen there?

Stage 3 diagnosis

3 of 5 suspected causes proven: **Shelf labels the scanner can't read**, **Look-alike strengths stored side by side** and **Overflow stock has no fixed place**, and 1 proposed fix to send back

Proven: **Shelf labels the scanner can't read** (38% against 5.5%, 71% of all cases); **Look-alike strengths stored side by side** (4% against 1.3%, 40% of all cases); **Overflow stock has no fixed place** (8% against 1.2%, 37% of all cases).

Ruled out: **Pickers rush at the end of a shift** (14.3% against 14%).

Minor: **New pickers** (6% against 3%).

Where the proven causes sit: **3 causes in the work area or how people are trained, for 5S.**

Fixes proposed: **A manager's second check on every order**: no cause behind it, send it back.

What this may mean

These are the causes the data supports, and **Pickers rush at the end of a shift** looked likely but the data says no. Ruling causes out is the point of this stage. A fix with no proven cause behind it costs money and fixes nothing; **A manager's second check on every order** should go back until its cause is proven.

Investigate next

In stage 4, put the work areas where errors start into a known, marked condition with 5S, one change at a time, starting with **Shelf labels the scanner can't read**, **Look-alike strengths stored side by side** and **Overflow stock has no fixed place**.

A cause is proven when the group goes wrong at least 1.5 times as often as the rest, the difference is unlikely to be chance (a two-proportion test, p under 0.05), and the group holds at least a fifth of the cases. A smaller real difference is minor; no real difference is ruled out.

For a range, the band with the highest rate is compared with all the others together.

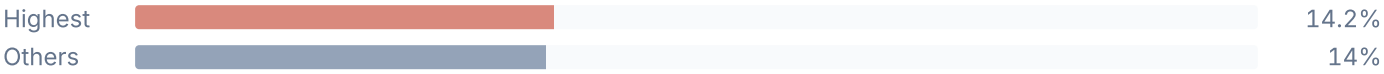
Suspected causes, tested

EXPLAINING

Code typed in by hand at the shelf

SUSPECTED CAUSE	WHERE IT SITS	HOW IT WAS TESTED	RESULT
Pickers rush at the end of a shift	Workload or timing	Lines with a typed code by hour of the day	**Ruled out** Flat across the range
Shelf labels the scanner can't read	The work area	Lines with a typed code: picks at the 260 shelves with labels over three years old, against the rest	**Proven** 38% against 5.5%, 71% of all cases
Look-alike strengths stored side by side	The work area	Lines with the wrong item: products stored next to another strength, against the rest	**Proven** 4% against 1.3%, 40% of all cases
Overflow stock has no fixed place	The work area	Lines with an error: lines picked from the overflow area, against the rest	**Proven** 8% against 1.2%, 37% of all cases
New pickers	Training or experience	Lines with an error by months in the job	**Minor** Higher in first month in the job only (6% against 3%)

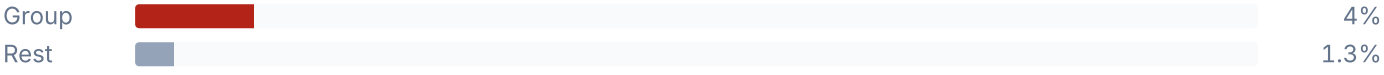
Pickers rush at the end of a shift Ruled out



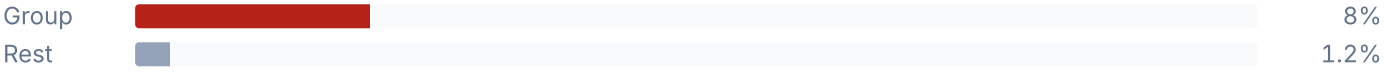
Shelf labels the scanner can't read Proven



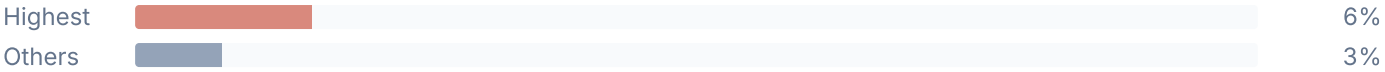
Look-alike strengths stored side by side Proven



Overflow stock has no fixed place Proven



New pickers Minor



The share with the problem in the group (or the highest band) against the rest. Proven causes are in red.

Where the proven causes go next

Stage 4: 5S, in the work area

- Shelf labels the scanner can't read
- Look-alike strengths stored side by side
- Overflow stock has no fixed place

Stage 5: the process owner

None

The fixes proposed

FIX PROPOSED	THE CAUSE IT FIXES	DECISION
A manager's second check on every order	None given	**Send it back**: no cause behind it

DECISION POINT

Take 3 proven causes to stage 4

All of them sit in the work area, which is what 5S fixes. Send back a manager's second check on every order: it fixes none of the proven causes.

STAGE 4 OF 6

How do you make the right way the easy way?

Stage 4 diagnosis

Aisles 1 and 2: 14% before, 3% after, with 2 areas in a marked, known condition

Aisles 1 and 2: **5 of 5 steps written, audit 90%, weakest at Shine; 14% before, 3% after; passes the doorway test.**

Overflow area: **5 of 5 steps written, audit 85%, weakest at Shine; 8% before, 2.5% after; passes the doorway test.**

Mistake-proofing: **Aisles 1 and 2 has a step made impossible to get wrong.**

Proven causes covered: **All 3 proven work-area causes from stage 3.**

Weekly audits, **Aisles 1 and 2**: **From 55% to 90% over 4 audits.**

Weekly audits, **Overflow area**: **From 45% to 85% over 3 audits.**

What this may mean

Each area now has a marked, known condition, so a mistake looks wrong before it reaches a customer, and the weekly audit shows when it slips.

Investigate next

In stage 5, give the whole process one owner and one measure from start to finish. Spread the changes to the other areas once they hold.

Each time the results are seen, that day's audit score is kept in the progress file with its date, so reopening the file each week builds the trend.

The audit has two questions for each of the five steps, scored No (0), Partly (1) or Yes (2). An area's score is its points over the most it could get; a step under half is a weak spot.

Change one thing at a time where you can, and measure the error rate after each, so you can tell which change worked.

Each area's audit, by step

AUDITED

2 work areas

Aisles 1 and 2

90%

audit score

Sort	100%
Set in order	100%
Shine	75%
Standardize	100%
Sustain	75%

Passes the doorway test · mistake-proofed

Audits: Oct 19 55% → Oct 26 70% → Nov 2 80% → today 90%

Overflow area

85%

audit score

Sort	75%
Set in order	100%
Shine	50%
Standardize	100%
Sustain	100%

Passes the doorway test

Audits: Oct 26 45% → Nov 2 65% → today 85%

Errors before and after

Aisles 1 and 2 Lines with a typed code — down 79%

Before	14%
After	3%

Overflow area Lines with an error — down 69%

Before	8%
After	2.5%

What changed at each step

STEP	AISLES 1 AND 2	OVERFLOW AREA
Sort	1,100 doubtful cartons red-tagged and moved out for 30 days	Slow movers sent back to suppliers or written off
Set in order	New labels on 260 shelves; look-alike strengths moved apart, with a color band each	A fixed, labeled place for every overflow product, with a floor plan
Shine	Pickers check labels and clean scanners at the start of each shift	Floor and racks checked when stock is put away
Standardize	A photo of each aisle's standard at the aisle end	The floor plan posted at the entrance
Sustain	A 10-minute audit every week, with the score posted	Included in the weekly audit
Mistake-proofing	The scanner no longer accepts a typed code without a supervisor's badge	–

DECISION POINT

Take the results to stage 5

Aisles 1 and 2: 14% to 3%; Overflow area: 8% to 2.5%. Keep the weekly audit going, and spread the changes to the other areas once they hold.

STAGE 5 OF 6

Who owns the whole process, across every department?

Stage 5 diagnosis

Head of operations owns the chain from **the pharmacy's order** to **the pharmacy's satisfaction**, measured by **DPMO from the order to the pharmacy**

The chain: **4 departments, from the pharmacy's order to the pharmacy's satisfaction.**

Targets that work against the whole: **Purchasing and receiving and Warehouse can hit their own target while causing errors further down, and each has a change to its target.**

Process owner: **One named person: Head of operations, who can change other departments' targets.**

One measure, start to finish: **DPMO from the order to the pharmacy, 8,200 now, target 3,000.**

The to-be changes: **3 changes.**

What this may mean

One person now answers for the whole chain, with one measure that shows when it slips and targets that no longer reward sending errors on.

Investigate next

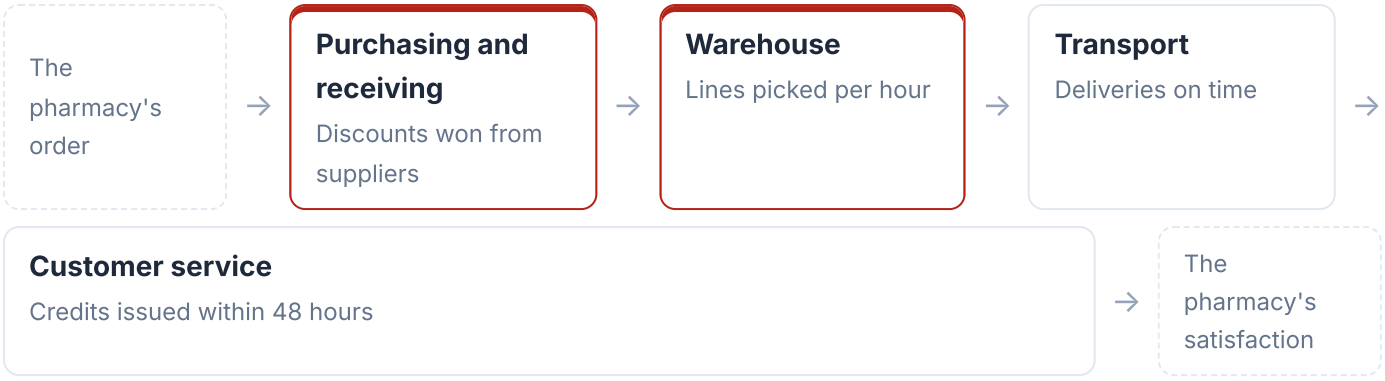
In stage 6, keep the improvements coming from the people doing the work, answering every suggestion within a week, and track **DPMO from the order to the pharmacy** every month.

As-is is how the work runs today, workarounds and all; to-be is the redesigned version you intend to run. The to-be changes are the steps from one to the other.

The chain, with one owner

THE CHAIN

The pharmacy's order to the pharmacy's satisfaction



Process owner: Head of operations

One measure: DPMO from the order to the pharmacy, 8,200 today, target 3,000

Monthly review from Dec 1, 2026

What each department measured, and its part in the errors

DEPARTMENT	WHAT IT MEASURED	ITS PART IN THE ERRORS	RULE ADDED TO ITS TARGET
Purchasing and receiving	Discounts won from suppliers	Accepted stock close to expiry for a better price	No stock accepted with under six months to expiry
Warehouse	Lines picked per hour	The typed codes and look-alike strengths	Errors per million lines added beside lines per hour
Transport	Deliveries on time	Damage from loose loading	–
Customer service	Credits issued within 48 hours	None; it saw every error last	–

Highlighted: a department that could hit its target while sending errors on.

From as-is to to-be

TO-BE CHANGE	DEPARTMENT	THE CAUSE IT FIXES
Stock with under six months to expiry refused at receiving	Purchasing and receiving	–
Cartons strapped and loaded by a loading plan	Transport	–
Customer service sends each week's credits to the process owner	Customer service	–

DECISION POINT

Take the owner and the measure to stage 6

Head of operations owns the chain, reviewing DPMO from the order to the pharmacy every month.

STAGE 6 OF 6

How do errors keep falling after the project ends?

Stage 6 diagnosis

The defect rate fell from 8,200 to 3,000 DPMO, with 5 suggestions answered in a median 2 days

Suggestions: **5 suggestions: 5 answered; 4 tried, 4 kept.**

Time to an answer: **Half are answered within 2 days.**

The flow: **Suggestions came in over 4 weeks, 2 in the last four weeks.**

The defect rate: **From 8,200 to 3,000 DPMO over 6 months, down 63%.**

Found by customers: **From 66% to 40% of the errors.**

What this may mean

Small improvements are coming from the people doing the work and getting answers quickly, and the rate is falling. Kaizen produces little in its first months; the flow matters more than the count.

Investigate next

Track DPMO every month with the same definitions, and the share customers find. When the rate stops falling, run stages 2 and 3 again.

DPMO each month uses the definitions fixed in stage 1: defects divided by units times the chances in each, times a million. A rate counted differently can't be compared.

The rate counts as stopped when the last three months are no lower than the best month before them.

The suggestions

5	2 days	0	4 of 4
suggestions	Median wait for an answer	Waiting more than a week	Tried, and kept

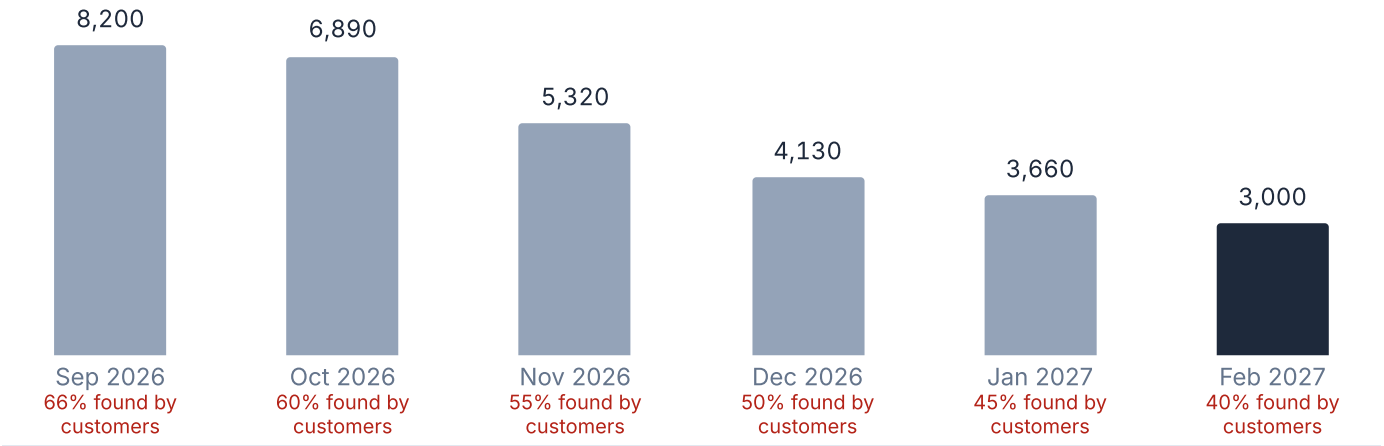
SUGGESTION	WHO	RAISED	ANSWER	WHAT CAME OF IT
Put the fastest-selling strengths at waist height	Picker, aisle 2	Oct 5, 2026	2 days later	Tried, then everywhere
A red bin for cartons that arrive damaged	Receiving clerk	Oct 8, 2026	4 days later	Tried, and kept
Longer scanner cables	Picker, aisle 5	Oct 13, 2026	6 days later	Not done, and told why
Grid letters on the overflow racks, to match the floor plan	Picker, overflow area	Feb 15, 2027	2 days later	Tried, and kept
Charge the spare scanners by the dock, not in the office	Loader	Feb 22, 2027	2 days later	Tried, and kept

Highlighted: waiting more than a week for an answer.

The defect rate, month by month

SEP 2026 TO FEB 2027

8,200 to 3,000 DPMO, down 63%



Target: 3,000 DPMO, reached in Feb 2027.

DECISION POINT

Keep going

Suggestions are answered in a median of 2 days. The defect rate is down 63% since the first month.

Made with the free Error Reduction Tool at whichframework.org/tools/error-reduction-tool.html: all six stages of the "Reduce errors and defects" playbook. Figures are from your data; the diagnosis describes what such patterns often point to, not proven causes.