Kit-label improvement project

One invented project

The example is a kit packing cell with wrong labels. The workbook follows one bounded improvement project through DMAIC while a team manages sprint cadence, a two-task WIP limit, a prepared three-day kaizen event and a small decision cell. All people, events and counts are fictional.

What the completed cards show

Twenty completed cards preserve the path from charter and baseline through cause evidence, Lean Lab, authorized rack move, pilot, follow-up and schedule audit. Ninety-five blank cards remain in the separate print and digital interiors.

Quality observations

The baseline has 96 wrong-label kits among 1,200 inspected. The bundled pilot has 20 among 800, and a later observation has 14 among 500. Throughput is 52, 50 and 51 kits/hour respectively. These nonrandom cohorts do not identify a causal effect.

Project-time observation

The original phase schedule totals 90 calendar days; the invented actual route totals 63. Twenty-seven fewer days than planned is a descriptive schedule comparison. There is no independently observed traditional-project counterfactual.

Project time and quality arithmetic

Defect rate

Rate = defective eligible kits / eligible inspected kits. Baseline 96/1,200=8.00%; pilot 20/800=2.50%; follow-up 14/500=2.80%.

Reason reconciliation

52 wrong rolls + 29 manual selections + 15 missed first-piece checks = 96. First category share = 52/96 = 54.17%.

Quality change

Absolute difference = 8.00% - 2.50% = 5.50 percentage points. Relative reduction = (8.00%-2.50%)/8.00% = 68.75%.

Lab observations

Unkeyed mock setups: 6/20=30%. Keyed: 1/20=5%. Descriptive difference = 30%-5%=25 percentage points. These forty mock runs are not the pilot.

Throughput rule

Minimum = 52 x (1-0.05) = 49.4 kits/hour. Pilot change = (50-52)/52 = -3.85%. Follow-up change = (51-52)/52 = -1.92%.

Phase totals

Reference = 10+20+15+20+25 = 90 calendar days. Actual = 7+14+11+17+14 = 63. Difference = 90-63 = 27 days.

Proportional schedule gap

Gap/reference = 27/90 x 100 = 30.00%. Actual/reference = 63/90 x 100 = 70.00%. This is not a causal impact estimate.

How to read the filled cards

Evidence

A real team would retain kit-level inspection records, approved project clocks, event pre-read, lab scenarios, as-built rack layout, pilot data, gate requests and decisions under controlled IDs.

Selection and causality

The intervention bundles several physical and behavioral changes. The time route also bundles sprint cadence, WIP, dedicated event and decision cell. No random assignment or untreated control project isolates a component.

Quality and safety

A lower defect rate cannot excuse an unauthorized release, false first-piece acceptance or harmful rack condition. These events require immediate stop and investigation even if the aggregate rate passes.

Durability

A short follow-up cannot prove a stable long-term effect. The teaching closeout names an owner, reaction and later review. A live project needs its own appropriately long and representative observation.

DMAIC project charter

FICTIONAL RECORD | Selected project decision trail

1. Problem and baseline period

In a fictional kit packing cell, 96 of 1,200 eligible inspected baseline kits carry a wrong label. The observation period is six invented weeks.

2. Primary CTQ and target

Primary CTQ: unique kits with a wrong label / all eligible inspected kits. Pilot target <=3.00% under the same rule.

3. Balancing measures

Pack throughput must remain at least 95% of 52 kits/hour, or 49.4 kits/hour. No intentionally unverified kit is released.

4. Scope and exclusions

One packing cell and its roll selection, first-piece check and final inspection; other lines and rework-only trials are excluded.

5. Sponsor, lead and gates

The fictional sponsor appoints a project lead, quality lead and cell owner; all five DMAIC gates require a dated decision.

Define decision gate

FICTIONAL RECORD | Selected project decision trail

1. Approved CTQ and cohort

The sponsor accepts the one-kit CTQ, the 1,200-kit baseline cohort rule and the pilot ceiling of 3%.

2. Clock and 90-day reference

Project day 0 is charter approval; Control gate ends the clock. Reference allocations 10+20+15+20+25 = 90 calendar days.

3. Resource and decision cell

Operator and quality time is reserved for a three-day event. A small decision cell targets at most two working days per response.

4. Open risk

Unknowns include reason-classification agreement, fixture availability and whether the keyed rack creates a new handling hazard.

5. Sponsor decision and date

Define gate is approved at calendar day 7. Measurement definitions and protection rules travel unchanged to Measure.

Defect event dictionary

FICTIONAL RECORD | Selected project decision trail

1. Kit ID and event

Each inspected kit has one stable invented kit ID and an inspection event under a recorded label-type revision.

2. Wrong-label criterion

A wrong label means the applied identity does not match the kit definition at the final accountable inspection point.

3. Duplicate event rule

Multiple scans or corrections on the same kit do not create more than one defective kit in a period.

4. Inspection point

Inspection occurs after packing and before authorized release; a first-piece check is a separate safeguard.

5. Ambiguous-unit disposition

Ambiguous IDs are checked against the source record and logged before inclusion or exclusion, with count impact reported.

Baseline CTQ calculation

FICTIONAL RECORD | Selected project decision trail

1. Eligible inspected kits

Baseline denominator n = 1,200 distinct eligible inspected kits; the cohort boundary is one cell and six invented weeks.

2. Wrong-label kits

Wrong-label numerator r = 96 distinct kits after duplicate scans and ambiguous labels are resolved.

3. Rate formula and result

Observed defect rate = r/n = 96/1,200 = 0.08 = 8.00%.

4. Period and mix

The teaching mix contains the same broad kit types later tagged in the pilot, though this does not prove full comparability.

5. Interpretation limit

This descriptive baseline is not a population defect probability or a causal explanation of its reasons.

Measure decision gate

FICTIONAL RECORD | Selected project decision trail

1. 96/1,200 validation

Counts reconcile from the invented kit-level extract: 1,200 distinct inspected units and 96 distinct wrong-label units.

2. Classification agreement

A blinded classification check is specified for live work; the teaching case assumes disputed classifications are resolved before gate approval.

3. Calendar and waits

Phase intervals are day 0–7 for Define and day 7–21 for Measure. The task waiting log retains source and owner.

4. Open data risk

No unresolved missing kit ID is allowed to silently become a correctly labeled unit. Any residual gap is documented.

5. Gate decision and date

Measure gate approves the 8.00% baseline at day 21, with explicit limitations on sample and mix.

Defect reason Pareto

FICTIONAL RECORD | Selected project decision trail

1. Reason categories and rule

Each defective kit receives one mutually exclusive first verified reason: wrong roll loaded, manual selection or missed first-piece check.

2. Count by category

Reason counts are 52, 29 and 15 respectively for the 96 wrong-label kits.

3. Reconciled total

Reconciliation: 52 + 29 + 15 = 96; a case does not enter two reason categories.

4. Cumulative share

Cumulative share after wrong roll = 52/96 = 54.17%; after two categories = (52+29)/96 = 84.38%.

5. Priority question

Investigate roll loading first, while preserving selection and first-piece mechanisms as separate risks.

Cause hypothesis register

FICTIONAL RECORD | Selected project decision trail

1. Proposed cause

Hypothesis: visually similar rolls and an unkeyed rack permit a wrong roll to be loaded during setup.

2. Expected observation

Trace review should find the wrong roll in place before the first affected kit and a choice path that the operator could reasonably follow.

3. Counterexample

Correct setups with similar rolls, or wrong labels despite a correct roll, challenge a simple one-cause account.

4. Test and owner

Quality lead observes safe setups and verifies a small invented sample of failed and good traces; no customer kit is used in the lab.

5. Decision rule

A keyed-rack prototype advances only if the mock scenarios reduce wrong choices without defeating first-piece confirmation.

Kaizen event readiness check

FICTIONAL RECORD | Selected project decision trail

1. Data quality status

The 96 wrong-label units and 52+29+15 reasons are reconciled and available as a pre-read before event day 34.

2. Test scenarios

The Lean Lab has similar-roll mock setups, unkeyed and keyed options, a clock and error-count rule.

3. Released participants

Operator, quality and cell-owner roles are released from routine work for days 34–36 with assigned shift cover.

4. Material or fixture

A noncustomer mock kit, safe rack fixture and labeled test rolls are available; a pinch or trip hazard stops the session.

5. Move-day authority

Quality lead and cell owner can approve or reject the physical move; the sponsor resolves scope or resource changes.

Analyze decision gate

FICTIONAL RECORD | Selected project decision trail

1. Priority mechanism

The wrong-roll mechanism is plausible from the reason census and linked setup traces, but a rack fix has not yet been causally verified.

2. Counterevidence

Some wrong labels arise after correct roll loading, so selection and first-piece safeguards remain in the bundle.

3. Approved pilot thresholds

Prespecified pilot: no more than 3% wrong labels among 800 eligible inspected kits, throughput at least 49.4 kits/hour.

4. Team/event readiness

The data packet, mock scenarios, protected people, fixture and move-day decision route are ready.

5. Decision and date

Analyze gate at day 32 authorizes a bounded event and pilot under a safety veto, not immediate general release.

Prespecified pilot protocol

FICTIONAL RECORD | Selected project decision trail

1. Pilot eligible units

Take the next 800 eligible inspected production kits after an approved setup revision, retaining label-family and shift tags.

2. Primary target and numerator

Primary ceiling = 3%; maximum wrong-label count under fixed n is 800 x .03 = 24 kits.

3. Throughput floor

Throughput floor = 52 x (1-.05) = 49.4 kits/hour, measured by the same working-time convention.

4. Unauthorized-release trigger

An unverified or mismatched first-piece kit, unsafe rack condition or unauthorized release stops exposure for investigation.

5. Approval before observation

Sponsor and quality lead approve the denominator, limits, inspection and stop criteria before the first pilot kit.

Lean Lab run record

FICTIONAL RECORD | Selected project decision trail

1. Scenario and run ID

The event lab uses 40 invented mock setups across similar label-roll scenarios on day 35.

2. Option and role

Twenty unkeyed and twenty keyed mock setups are run by the assigned operator and observer under the stated scenario list.

3. Wrong choice or delay

Wrong choices: 6/20 unkeyed = 30% and 1/20 keyed = 5%; the descriptive gap is 25 percentage points.

4. Hazard or stop

No mock kit is shipped. Any pinch or access concern pauses the run and enters the hazard log.

5. Revision after run

Revise the cue and retain the first-piece check. The small lab contrast selects a pilot option; it is not a field-effect estimate.

Move-day authorization

FICTIONAL RECORD | Selected project decision trail

1. What moves

On event day 36, move the label-roll rack to a keyed position and attach a controlled roll-identity cue.

2. Who approves

Quality lead authorizes the move after lab and safety review; the cell owner approves space and shift coverage.

3. Safety check

Check reach, handling clearance, fixture stability and confirmation of the first correctly labeled kit.

4. Fallback state

The old rack position and work instruction are photographed and retained as a rollback path if a safety or quality trigger occurs.

5. Record of decision

Record the decision timestamp, approvers, as-built layout ID and revision before pilot production begins.

Pilot unit and defect log

FICTIONAL RECORD | Selected project decision trail

1. Eligible unit count

The fictional pilot includes n = 800 distinct inspected production kits under the released test revision.

2. Defect count

The inspected wrong-label count is r = 20 unique kits; repeated scans remain attached to the same kit.

3. Exclusions

Rework-only mock setups and lab scenarios are excluded, as predeclared; the pilot is not a randomized cohort.

4. Inspection coverage

The invented record assumes every eligible pilot kit reaches the accountable inspection point.

5. Data owner

The quality analyst owns source reconciliation and preserves reason, shift and label-family tags.

Pilot CTQ calculation

FICTIONAL RECORD | Selected project decision trail

1. Baseline rate formula

Baseline rate = 96/1,200 = 8.00%.

2. Pilot rate formula

Pilot rate = 20/800 = 2.50%, below the prespecified 3.00% ceiling (20 <= 24).

3. Absolute difference

Absolute difference = 8.00% - 2.50% = 5.50 percentage points.

4. Relative difference

Relative reduction = (8.00% - 2.50%) / 8.00% = 68.75%.

5. Causal limitation

The intervention is a bundle and the cohorts are nonrandom. The contrast cannot isolate an accelerator or product-change effect.

Throughput balancing test

FICTIONAL RECORD | Selected project decision trail

1. Baseline kits/hour

Reference throughput is 52 kits/hour under the invented normal setup and working-time rule.

2. Pilot kits/hour

Pilot throughput is 50 kits/hour using the same numerator and hour definition.

3. Change percentage

Relative change = (50 - 52)/52 = -0.03846 = -3.85%.

4. Prespecified floor

Prespecified floor = 52 x (1 - .05) = 49.4 kits/hour; 50 exceeds this floor by 0.6.

5. Response if breached

The balancing rule is met. If a future run falls below the floor, the owner investigates the check design before release.

Improve decision gate

FICTIONAL RECORD | Selected project decision trail

1. 2.50% versus 3% target

Primary observed pilot rate = 20/800 = 2.50%, at or below the 3.00% ceiling.

2. 50 versus 49.4 floor

Observed throughput = 50 kits/hour, at or above the 49.4 floor.

3. Residual risks

No unauthorized release is recorded in the invented 800-unit pilot, but a zero observation is not a zero-risk claim.

4. Rollout authority

The small decision cell approves a staged rollout with an immediate quality stop and rollback route.

5. Decision and date

Improve gate is dated day 49; Control receives the same defect definition, revised rack layout and work instruction.

Control-period rate and guardrail

FICTIONAL RECORD | Selected project decision trail

1. Defect count and denominator

Follow-up has 14 distinct wrong-label kits among 500 distinct eligible inspected kits.

2. Rate formula

Observed follow-up defect rate = 14/500 = 0.028 = 2.80%.

3. Throughput value

Follow-up throughput = 51 kits/hour, using the same rate convention as the baseline and pilot.

4. Threshold result

The 2.80% rate remains under 3.00%; 51 remains above the 49.4-kit/hour balancing floor.

5. Comparability limitation

The invented follow-up is short. Differences in shift and label mix or inspection practice could affect a real comparison.

Gate duration audit

FICTIONAL RECORD | Selected project decision trail

1. Reference phase days

Reference phase days: Define 10, Measure 20, Analyze 15, Improve 20, Control 25.

2. Actual phase days

Actual intervals: Define 7, Measure 14, Analyze 11, Improve 17, Control 14 calendar days.

3. Total and formula

Reference total = 10+20+15+20+25 = 90. Actual total = 7+14+11+17+14 = 63.

4. Schedule difference

Difference by phase = 3, 6, 4, 3 and 11 days; sum = 27 calendar days.

5. Interpretation limit

This is a schedule audit, not evidence that each acceleration engine caused its allocated difference.

Project-time calculation

FICTIONAL RECORD | Selected project decision trail

1. Reference start and finish

Initial plan runs from project day 0 to day 90 under the same calendar-day clock.

2. Actual start and finish

Actual route runs from day 0 to Control decision at day 63; no hidden pause is subtracted.

3. Difference formula

Absolute difference = planned duration - actual duration = 90 - 63 = 27 calendar days.

4. Percent formula

Proportion of reference = 27/90 x 100 = 30.00%. Actual/reference = 63/90 = 70.00%.

5. No-counterfactual wording

Use “completed 27 days earlier than the initial schedule”; no untreated counterfactual project was observed.

Control decision gate

FICTIONAL RECORD | Selected project decision trail

1. 2.80% follow-up rate

A 500-unit follow-up yields 14/500 = 2.80%, below the 3.00% observed threshold.

2. 51 kits/hour

Follow-up throughput is 51 kits/hour, above the 49.4 floor, with the same working-time definition.

3. Unresolved risks

A 14-day follow-up does not establish long-term stability; rare safety events remain actively monitored.

4. Named owner

The named cell owner and deputy accept the control plan, versioned work instruction and immediate stop authority.

5. Decision at day 63

The project clock stops on day 63 with a conditional teaching closeout and a scheduled 30-day review.