Lean flow and system performance

25 workplace cases and method lessons / 18 pages. Select a chapter or use PDF bookmarks. Online links open the related lesson.

Lean flow and system performance

Begin with required good output and the route that delivers it. A fast local step can still create waiting or excess WIP elsewhere. Relate demand to available working time, then choose how adjacent processes connect. Reliable methods and quality support this connection. In parallel, test what limits the system goal; a large queue alone does not prove the constraint. Align release and supporting work to that evidence. Check delivery, quality, WIP and workload together before expanding a change. Lean flow questions and TOC constraint questions can support the same investigation while retaining their distinct controls.

What this system is for

Understand how the methods relate before selecting a detailed lesson.

Use the chapter to

1. Explain how customer need, reliable work and release decisions form one delivery system.
2. Distinguish work movement from the signals that authorize withdrawal and replenishment.
3. Connect constraint evidence, useful capacity, protected commitments and release discipline.

A route through the chapter

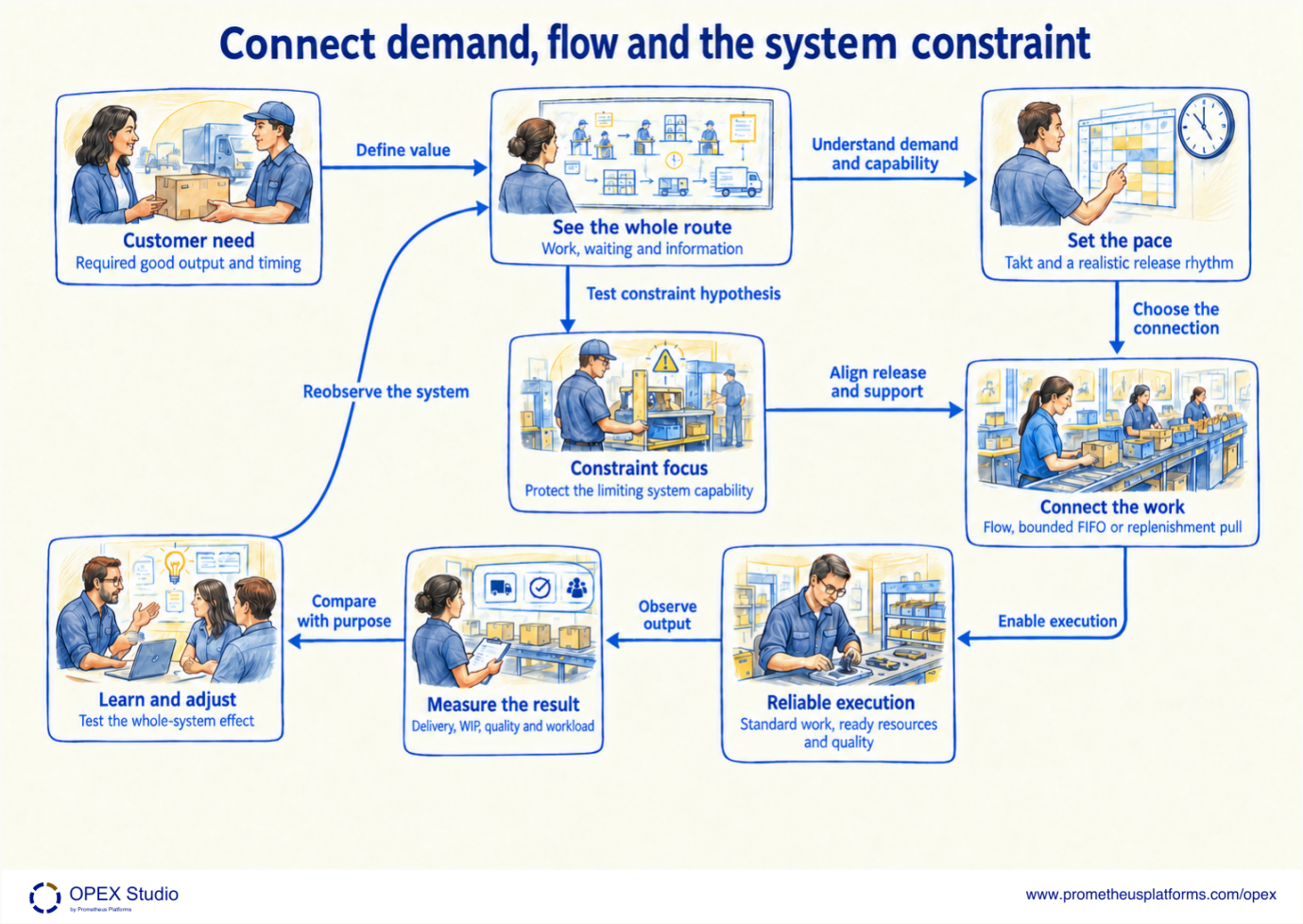
Begin with the three illustrated system maps. Read their connections and decisions, then use the original workplace teaching cards. The supporting lesson index links to the native method packs for worked inputs, practice, reasoned answers and facilitation.

25 mapped cases and method lessons. Illustrations teach the concepts; they are not records of achieved workplace results.

Open this chapter online

Connect demand, flow and the system constraint

Explain how customer need, reliable work and release decisions form one delivery system.



GENERATED CONCEPT ILLUSTRATION / FICTIONAL WORKPLACE

Read the connections

Begin with required good output and the route that delivers it. A fast local step can still create waiting or excess WIP elsewhere. Relate demand to available working time, then choose how adjacent processes connect. Reliable methods and quality support this connection. In parallel, test what limits the system goal; a large queue alone does not prove the constraint. Align release and supporting work to that evidence. Check delivery, quality, WIP and workload together before expanding a change. Lean flow questions and TOC constraint questions can support the same investigation while retaining their distinct controls.

Check the boundaries

Takt is a demand reference; it is not a measured cycle time.

Flow, FIFO and supermarket pull require different operating conditions.

The constraint hypothesis requires route and operating-state evidence, not queue size alone.

Read and apply the system / continued

Try it / discuss

A team proposes speeding an upstream step while downstream work waits for missing information. Where does the map send the team first?

Check your reasoning

Observe the complete route and the cause of downstream waiting. Test the constraint hypothesis and information readiness before assuming that upstream speed will improve delivery.

Method sources

Toyota Production System

LEI: Supplement to Learning to See

LEI: Supermarket

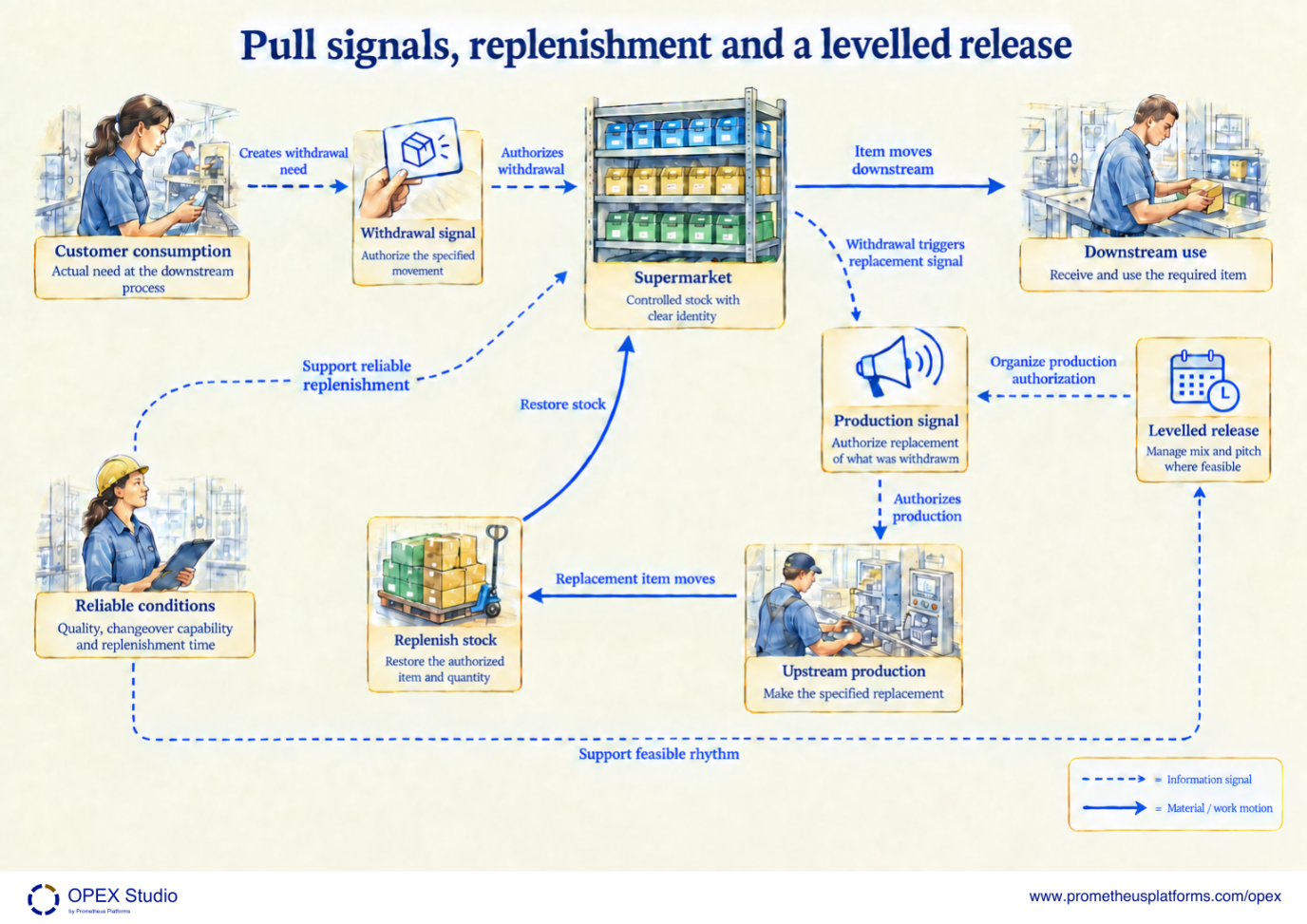
LEI: Takt Time

TOCICO: Introduction to TOC

TOCICO: Process of Ongoing Improvement

Pull signals, replenishment and a levelled release

Distinguish work movement from the signals that authorize withdrawal and replenishment.



GENERATED CONCEPT ILLUSTRATION / FICTIONAL WORKPLACE

Read the connections

Two kanban signals authorize different actions. A withdrawal signal permits movement of the specified item; a production signal permits its replacement. Keep the physical item route visually separate from the information route. Replenishment stock and signal quantities depend on actual demand, replenishment time, variation and policy; this overview prescribes no count. A levelled production release can organize mix and pitch where the process has the necessary capability. It does not mean every arriving order is produced immediately or that changeovers disappear. Quality at source, reliable replenishment and safe changeover improvement make smaller controlled releases more practical. Investigate missing or late signals rather than silently producing extra stock.

Check the boundaries

Withdrawal authorizes movement; production kanban authorizes replacement production.

Pitch combines takt with a chosen pack quantity; a levelled mix requires feasibility checks.

Stock and signal quantities need local evidence; the drawing prescribes no universal number.

Read and apply the system / continued

Try it / discuss

A downstream team needs material and sends a withdrawal signal. Does that signal alone authorize an upstream operator to produce any convenient batch?

Check your reasoning

No. The withdrawal signal authorizes the specified movement. Upstream production follows the appropriate production authorization, identity and quantity. Investigate a missing signal instead of substituting an unapproved batch.

Method sources

LEI: Kanban

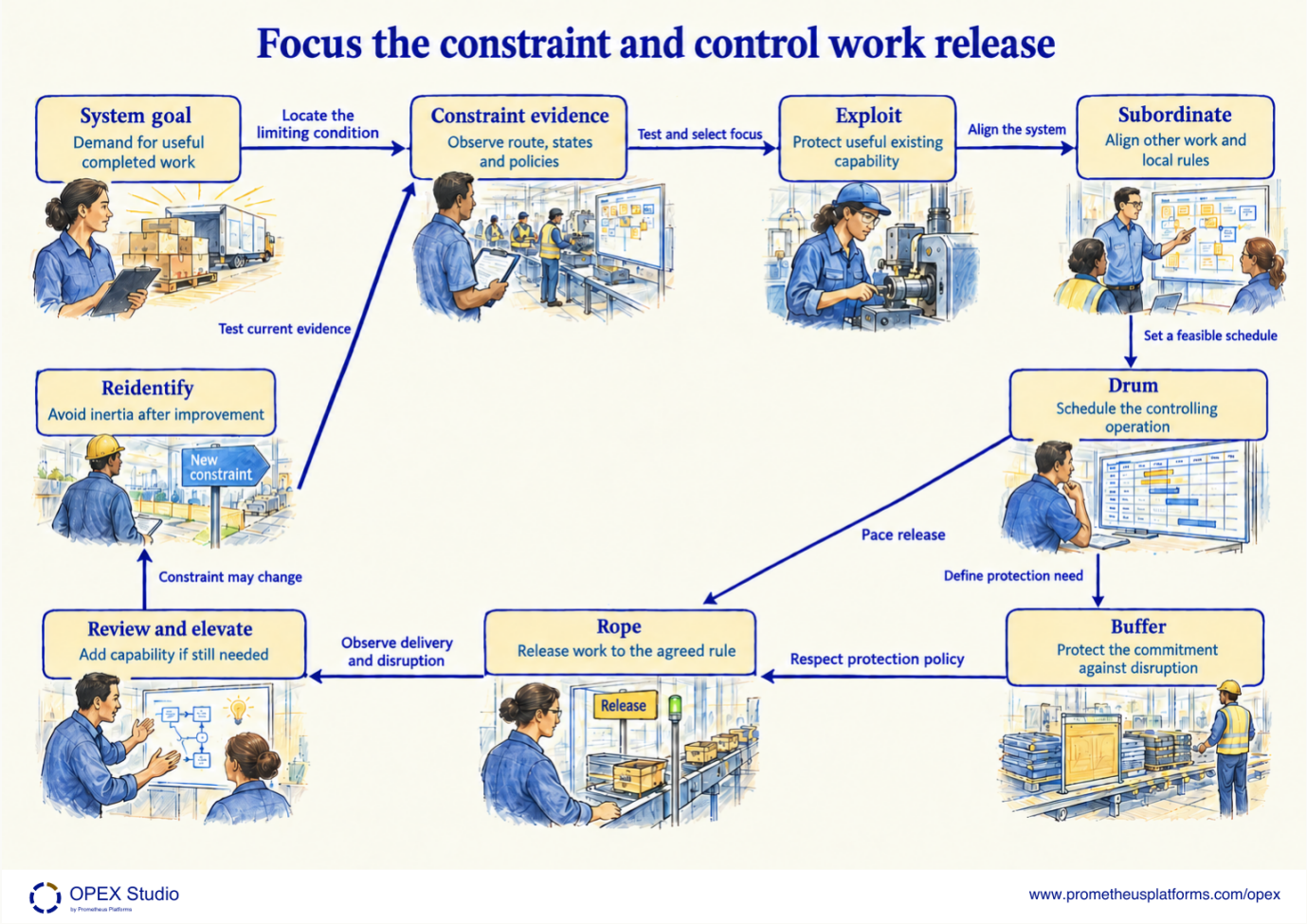
LEI: Heijunka Box

LEI: Supermarket

LEI: Single Minute Exchange of Die

Focus the constraint and control work release

Connect constraint evidence, useful capacity, protected commitments and release discipline.



GENERATED CONCEPT ILLUSTRATION / FICTIONAL WORKPLACE

Read the connections

Begin with the system goal and test what limits it. Protect useful existing capacity before assuming that investment is the first answer. Align upstream release, supporting work and local rules with that decision. In a drum-buffer-rope design, the drum provides the controlling schedule, the buffer protects a commitment and the rope controls release. Buffers do not justify arbitrary excess WIP or unsafe acceleration. Review actual disruption and delivery evidence to improve reliability. If further capacity remains necessary, evaluate elevation with the whole-system effect in view. Reidentify the current constraint after change; the previously slowest operation may no longer deserve the same priority.

Check the boundaries

DBR elements serve distinct functions: schedule, protection and release.

Buffer response requires a declared local policy; no universal color thresholds are supplied.

Exploitation and subordination may change the constraint before investment is needed.

Read and apply the system / continued

Try it / discuss

An upstream machine is idle while the controlling operation is fully supplied. A supervisor wants to release more work to improve local utilization. What should be checked?

Check your reasoning

Check the drum schedule, authorized release rule, buffer condition and actual system demand. Extra upstream work may add WIP without improving delivery. Local utilization alone does not establish a valid release.

Method sources

TOCICO: Five Focusing Steps, 2013

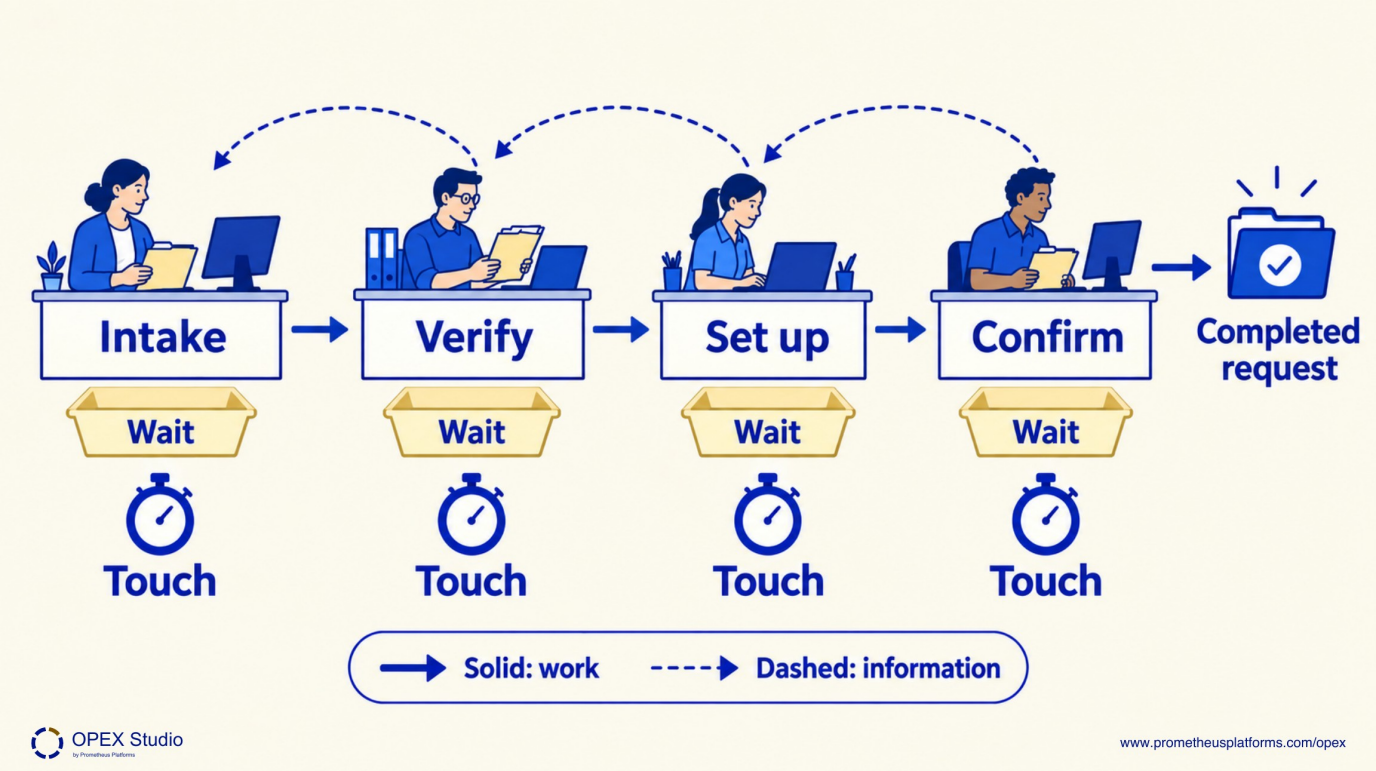
TOCICO: Introduction to TOC

Goldratt Japan: Drum Buffer Rope

TOCICO: Buffer Management

Show the waiting as well as the work

Shorten the handoffs



GENERATED TEACHING ILLUSTRATION / FICTIONAL WORKPLACE

Intake	Verify	Set up	Confirm
Wait 6.4 h	Wait 13.6 h	Wait 11.2 h	Wait 8.8 h
Touch 8 min	Touch 12 min	Touch 10 min	Touch 6 min

AUTHORED MAP ESTIMATE: 40 h waiting + 36 min touch = 40.6 business h

Processing share is 0.6 / 40.6 = 1.48% (rounded); processing does not automatically mean customer value.

Follow one request family from arrival to completion. The authored current-state estimate is 40 hours waiting plus 36 minutes processing:40.6 business hours in all. Show information returns as well as the forward route. Processing is not automatically value-adding; ask what serves the customer, what is required and what can change. An end-to-end map helps prevent a faster local step from simply moving the queue elsewhere.

TRY IT / DISCUSS

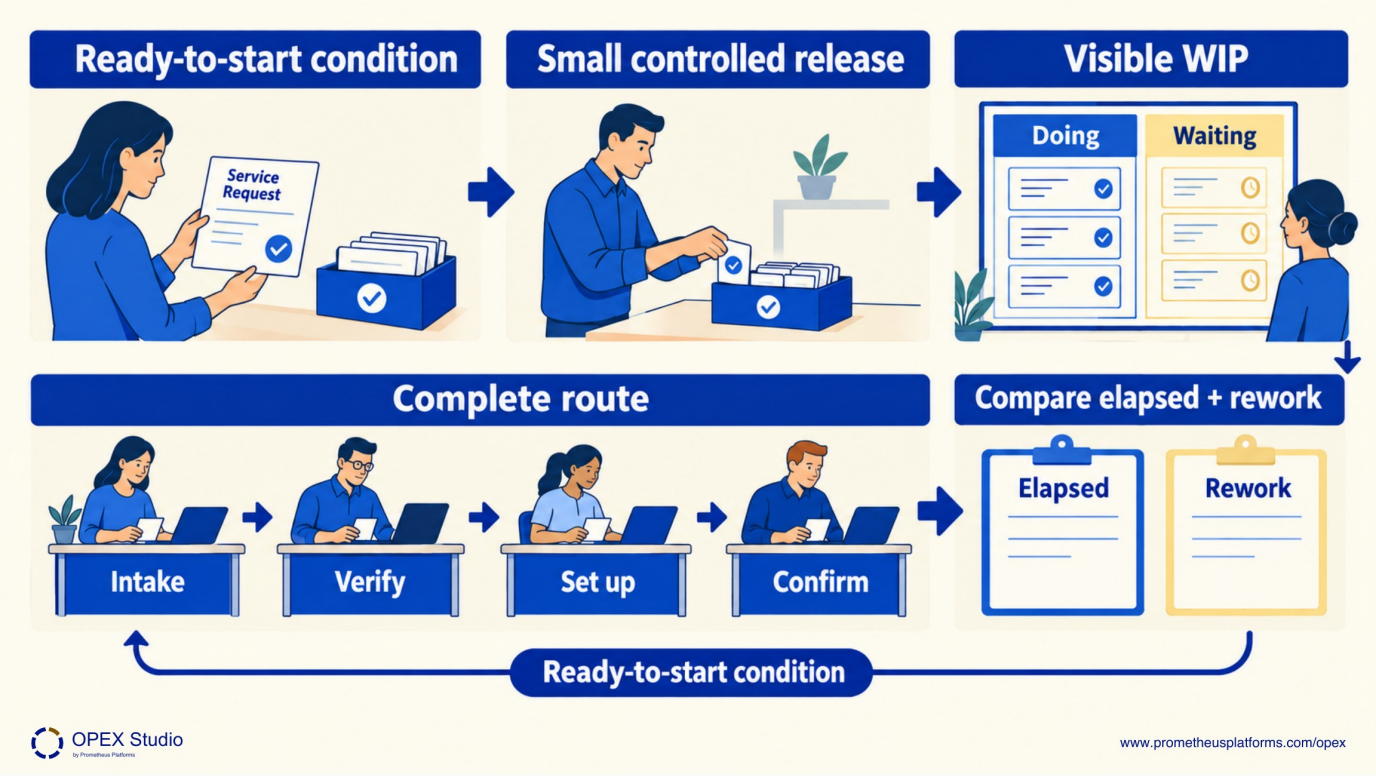
Does 36 minutes of touch time mean 36 minutes of customer value?

Check your reasoning: No. Touch time describes work duration; value requires a separate assessment of the activity.

METHOD SOURCES / F07: Value Stream Mapping | F08: Practicing Lean Fundamentals in an Office Environment | S01: LEI: Lean Thinking and Practice

Make a future-state hypothesis testable

Shorten the handoffs



GENERATED TEACHING ILLUSTRATION / FICTIONAL WORKPLACE

Actual after-trial lead time: not measured. Same route, clock and case definition required.

Proposed queue targets: 2, 4, 5 and 4 hours, totaling 15 hours. Proposed touch times: 8, 11, 10 and 6 minutes, totaling 35 minutes.

The retained future-state design has 15 hours of queues plus 35 minutes of processing, about 15.58 hours. It is a hypothesis below the 16-hour goal, not observed performance. Record arrival, work start, completion and clarification returns in the pilot. A visible work-in-process rule should serve reliable flow; check that waiting has not moved outside the map. Review completeness and rework with elapsed time.

TRY IT / DISCUSS

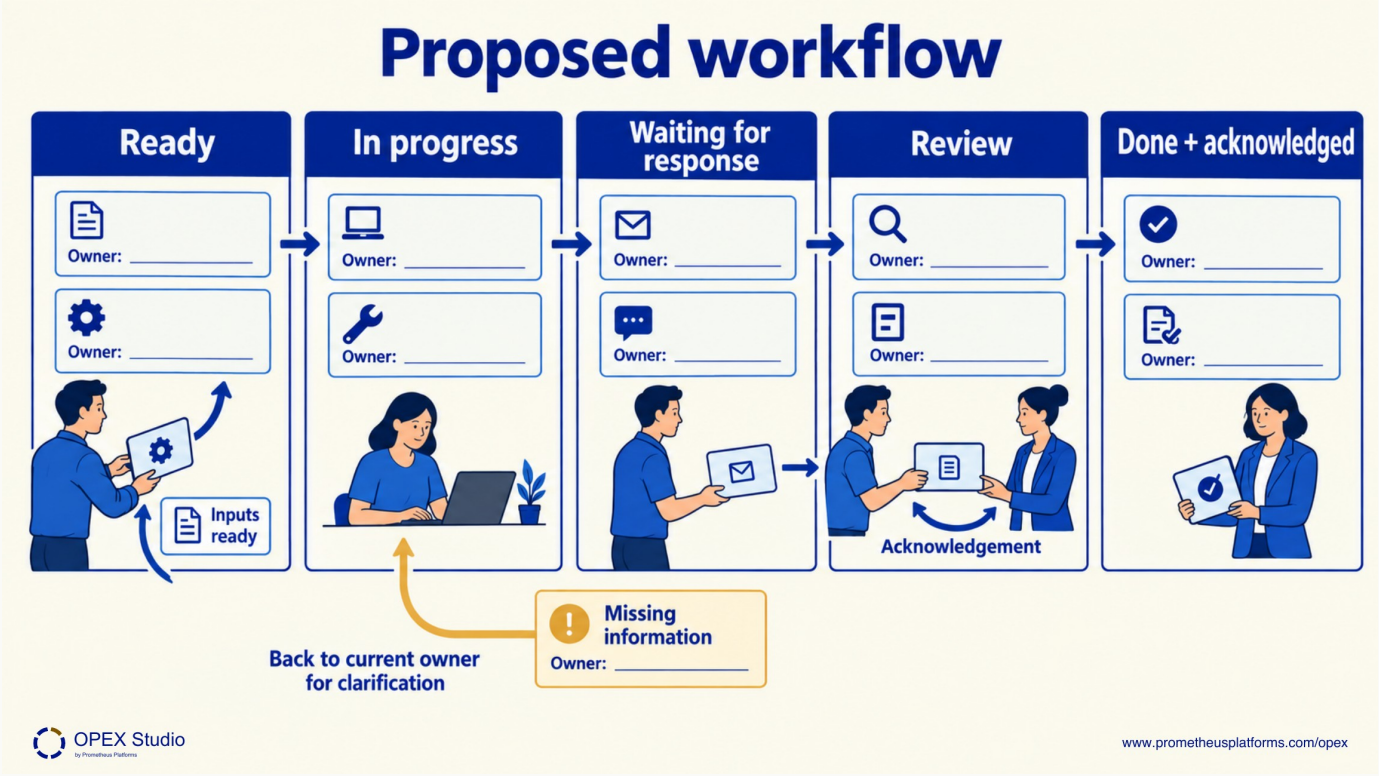
What must be recorded before claiming the future-state map worked?

Check your reasoning: Comparable actual end-to-end observations and balancing evidence, not only the proposed shorter route.

METHOD SOURCES / F07: Value Stream Mapping | F08: Practicing Lean Fundamentals in an Office Environment | S01: LEI: Lean Thinking and Practice

Give each request one visible next owner

Give the request a clear next step



GENERATED TEACHING ILLUSTRATION / FICTIONAL WORKPLACE

01	02	03	04	05
Ready	In progress	Waiting for response	Review	Done + acknowledged

Ready, In progress, Waiting, Review and Done are proposed board states, not the seven historical handoffs. Define which ownership transfers count.

The current case describes seven handoffs and a proposed three; it does not contain a measured seven-step route. Teach readers to trace the actual request and define which transfers count. A board makes readiness, ownership, blocked work and completion visible. Pull new work when agreed capacity is available, preserve necessary approvals and acknowledge receipt at every required transfer. A tidy desk is not evidence that the request route improved.

TRY IT / DISCUSS

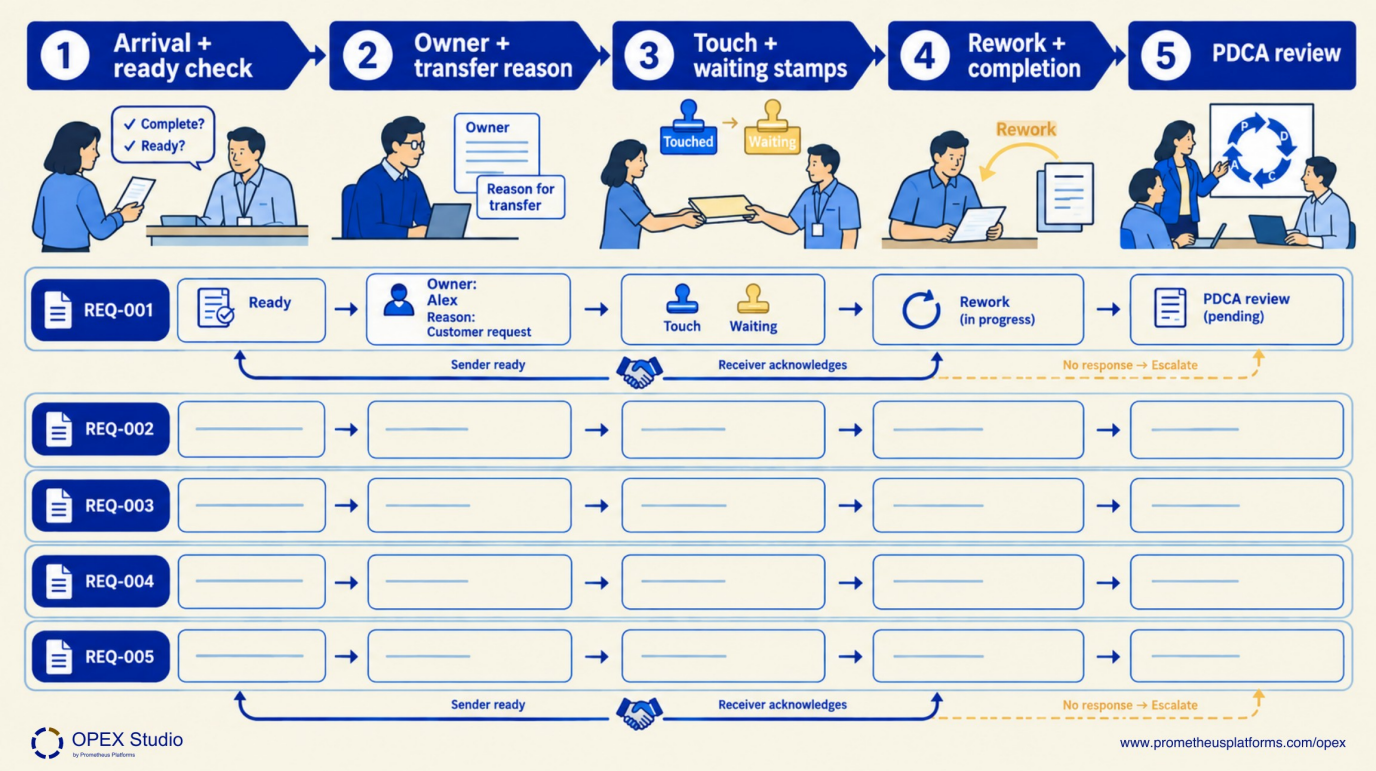
Does putting every incoming request into In progress create flow?

Check your reasoning: No. It can hide overload; make capacity, ageing and blocked work visible and use an explicit pull rule.

METHOD SOURCES / F08: Practicing Lean Fundamentals in an Office Environment | Q07: Gemba | Q01: Plan-Do-Check-Act Cycle

Trace five requests from arrival to acceptance

Give the request a clear next step



GENERATED TEACHING ILLUSTRATION / FICTIONAL WORKPLACE

Request	Owner / reason	Touch / waiting	Rework / accepted
1			
2			
3			
4			
5			

Use the planned five-request trace to discover the real route. Record who owns each next step, why the transfer occurs, when the request waits and what causes rework. Compare the whole request experience before removing a handoff. The aim is clear ownership and useful work, not bypassing controls. Review the trace with the people on both sides of the transfer and choose one small test.

TRY IT / DISCUSS

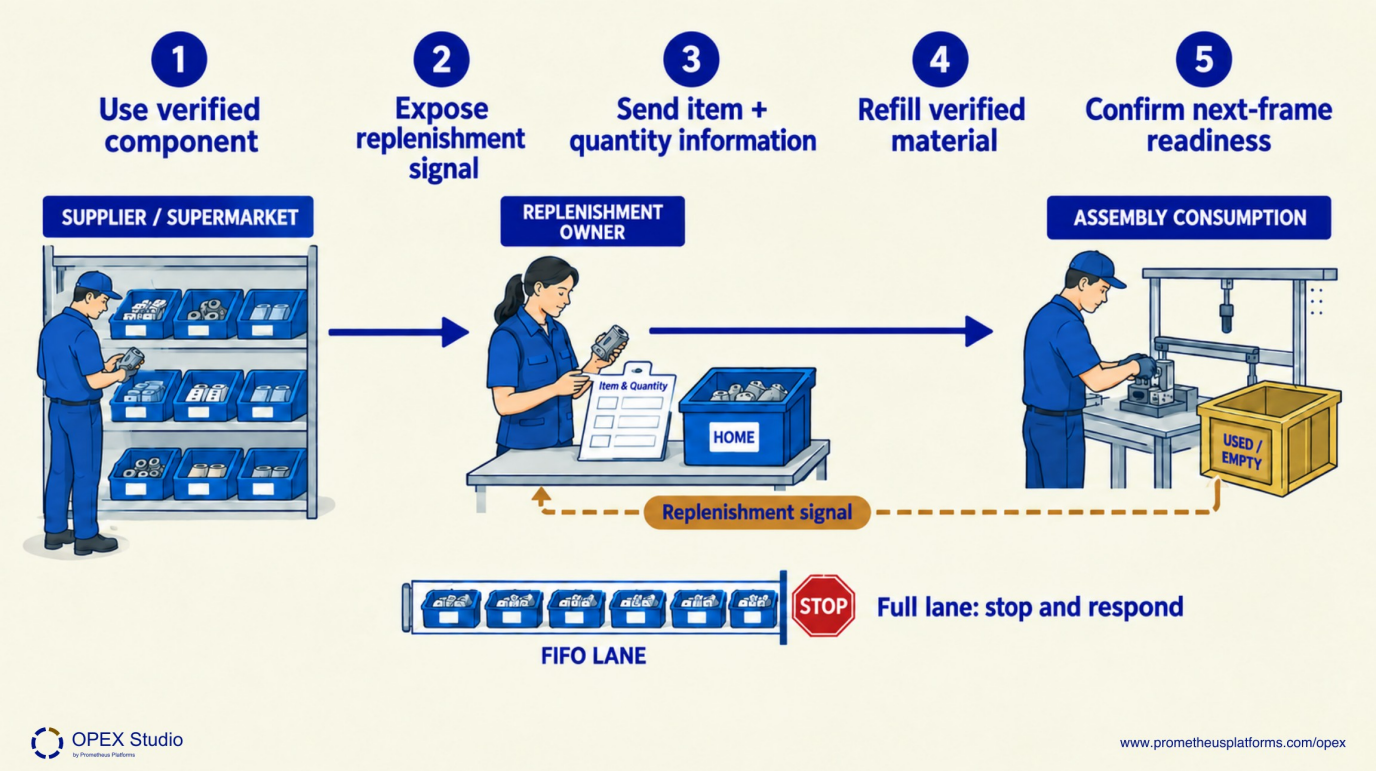
Can removing four handoffs be called an improvement without checking completion and rework?

Check your reasoning: No. Necessary decisions may have been lost or work transferred; verify the customer outcome.

METHOD SOURCES / F08: Practicing Lean Fundamentals in an Office Environment | Q07: Gemba | Q01: Plan-Do-Check-Act Cycle

Refill the right component for the next frame

Keep the assembly line ready for the next frame



GENERATED TEACHING ILLUSTRATION / FICTIONAL WORKPLACE

01	02	03	04	05
Use verified component	Expose replenishment signal	Send item + quantity information	Refill verified material	Confirm next-frame readiness

Material travels toward the using process; replenishment information returns upstream. Preserve part and lot identity and define the finite-lane response. A refill signal specifies item, quantity and responsible role. Synchronized flow requires an agreed demand and release rule, not independent pushing at every step.

The current case measures component search: twenty observations, 3.4-minute median, 1.5-minute goal. A replenishment loop connects consumption to the right refill and preserves identity. Make the signal, pack quantity, responsible person and full-lane response explicit. Level release to agreed customer demand and mix; do not schedule every upstream point independently. Search-time improvement alone cannot establish synchronized flow or line balance.

TRY IT / DISCUSS

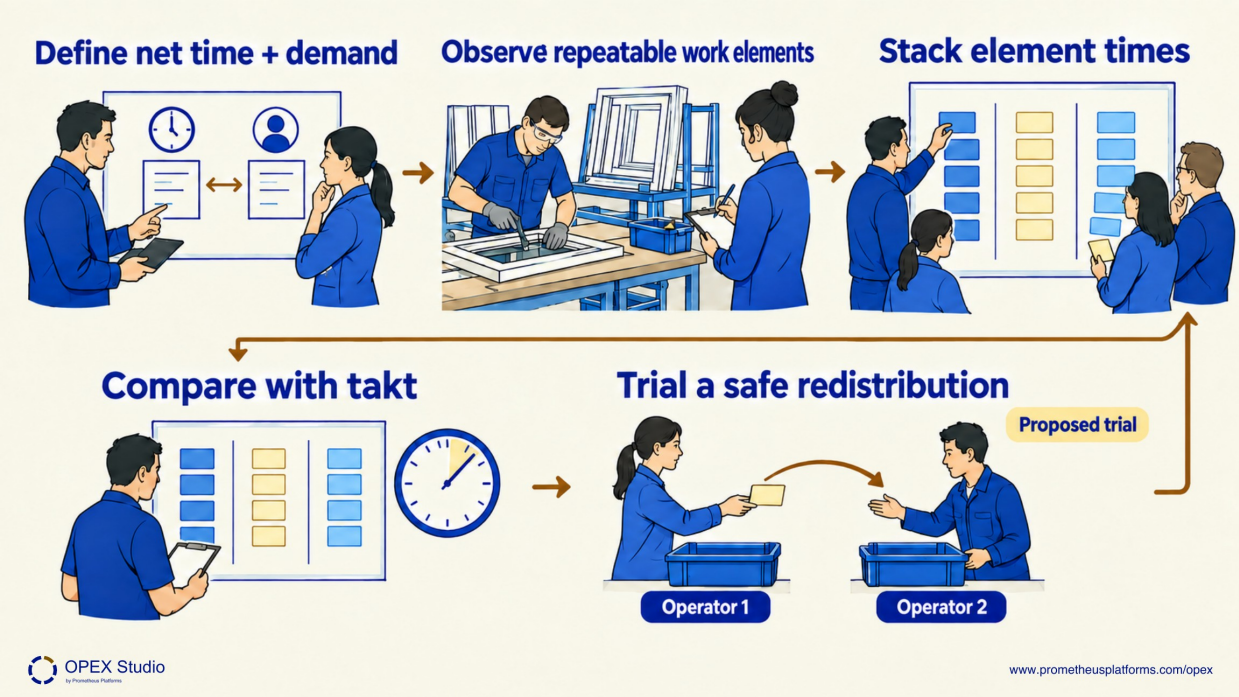
Which arrow carries the request to replenish, and which carries the parts?

Check your reasoning: Information travels back from consumption; replenished material travels toward the using process.

METHOD SOURCES / F05: Toyota Production System | F06: First In, First Out (FIFO) | F09: Lean Manufacturing: Don't Leave Home Without It! | F11: Operator Balance Chart | F13: Takt Time | F14: Heijunka | F17: Pull Production | F19: Heijunka Box

Balance work to demand using a yamazumi

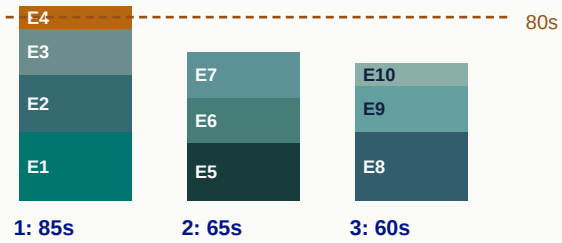
Keep the assembly line ready for the next frame



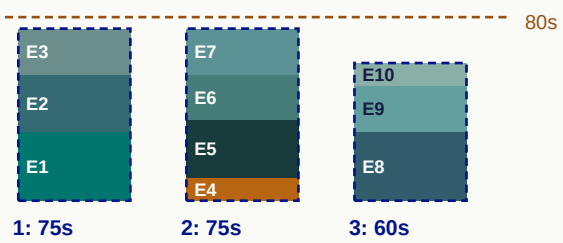
GENERATED TEACHING ILLUSTRATION / FICTIONAL WORKPLACE

NEW FICTIONAL EXERCISE / 400 min / 300 units = 80 s takt

Before



Proposed / unverified



E1 Position frame (30s)
E2 Prepare corner kit (25s)
E3 Confirm fixings (20s)
E4 Return empty tote (10s)
E5 Prepare seal kit (25s)
E6 Check component identity (20s)
E7 Record job reference (20s)
E8 Check frame readiness (30s)
E9 Confirm kit identity (20s)
E10 Acknowledge handoff (10s)

Yamazumi makes work elements and uneven loading visible. This new exercise is separate from the photo case. An 85-second station exceeds the 80-second demand rhythm; equal averages would hide it. Moving one transferable 10-second element gives a theoretical 75/75/60 balance, but precedence, skill, walking, ergonomics, variability and machine time must be checked. A theoretical balance does not demonstrate a stable method. Test the method with the team; do not turn the chart into a headcount target.

TRY IT / DISCUSS

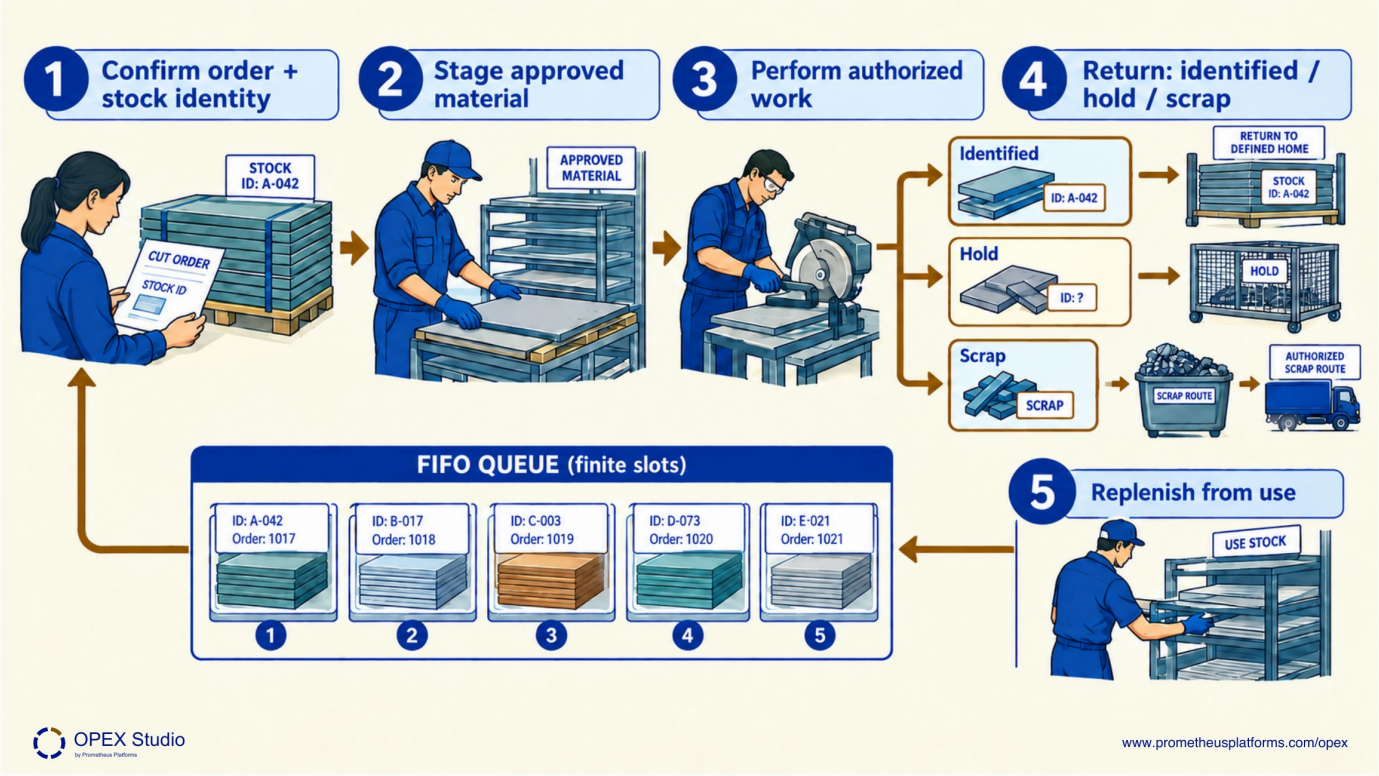
What remains to be checked after the bars fit below the takt line?

Check your reasoning: Safe feasible sequence, task transfer, variability, machine overlap, quality and actual end-to-end performance.

METHOD SOURCES / F05: Toyota Production System | F06: First In, First Out (FIFO) | F09: Lean Manufacturing: Don't Leave Home Without It! | F11: Operator Balance Chart | F13: Takt Time | F14: Heijunka | F17: Pull Production | F19: Heijunka Box

Keep stock identity through the whole route

A clearer start for every cut order



GENERATED TEACHING ILLUSTRATION / FICTIONAL WORKPLACE

01	02	03	04	05
Confirm order + stock identity	Stage approved material	Perform authorized work	Return: identified / hold / scrap	Replenish from use

Retained order-preparation search: 15 observations, median 4.8 minutes; proposed goal 2 minutes. It runs from released order to readiness of identified stock and verified preparation items.

The retained fifteen order-preparation search observations have a 4.8-minute median and 2-minute goal. Preserve grade, identity and traceability through preparation and return. A FIFO lane controls sequence only when entry, exit, capacity and exception rules are defined. Unknown material must not be made usable by a new label alone. The clean floor and stock layout cannot prove coolant source correction or a safe cutting method.

TRY IT / DISCUSS

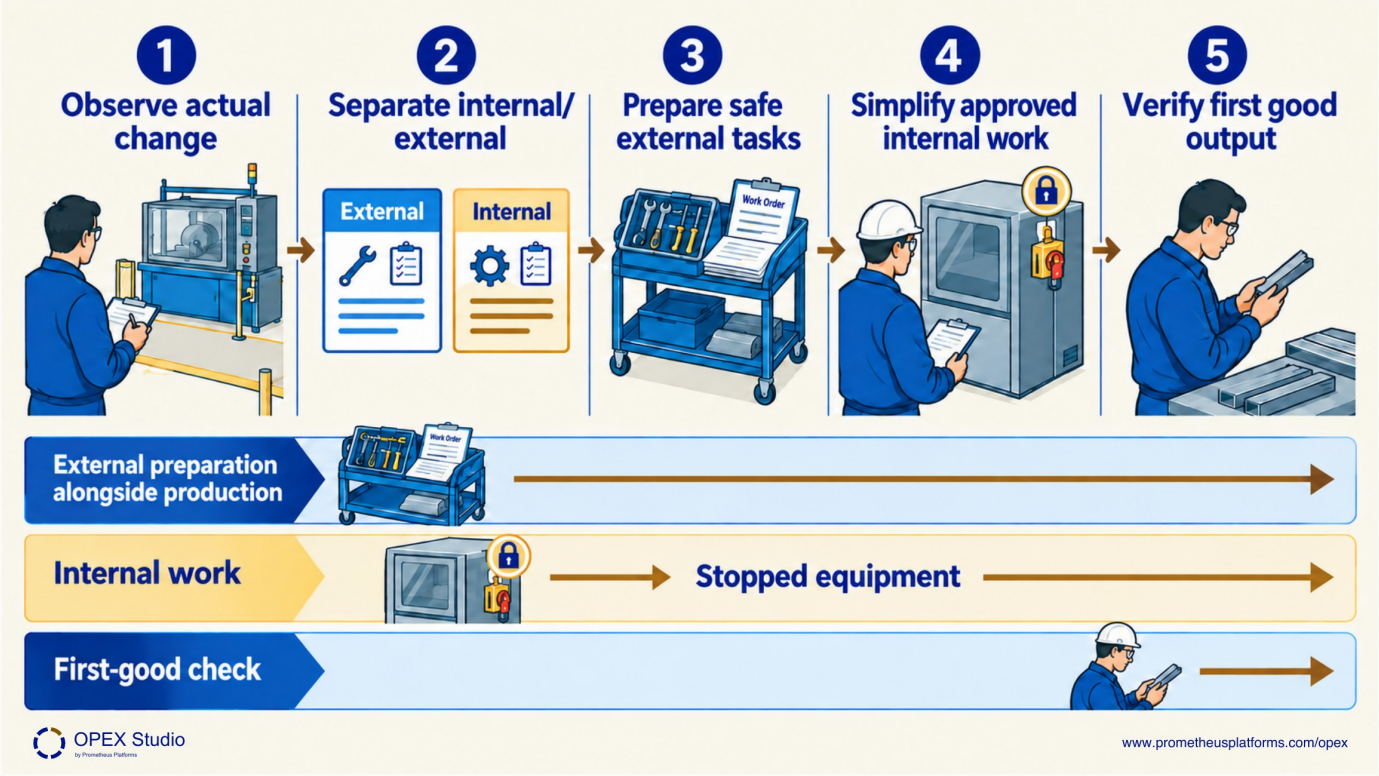
What happens when the FIFO lane is full?

Check your reasoning: Use the agreed stop/escalation rule; do not add an untracked overflow pile.

METHOD SOURCES / F06: First In, First Out (FIFO) | F12: Single Minute Exchange of Die | S04: OSHA: Control of Hazardous Energy

Prepare externally; protect the controlled change

A clearer start for every cut order



GENERATED TEACHING ILLUSTRATION / FICTIONAL WORKPLACE

01
Observe actual change

02
Separate internal/external

03
Prepare safe external tasks

04
Simplify approved internal work

05
Verify first good output

SMED studies changeover so suitable preparation can happen outside the machine-stopped period and necessary internal work can be simplified safely. It does not mean every setup must take one minute. Observe the actual change from last good output to first good output using a consistent definition. The saw case has no measured changeover dataset, so this page is an introductory teaching extension. Never reclassify a task as external if it needs isolation or another controlled state.

TRY IT / DISCUSS

Can all cleaning or adjustment be moved to while the machine runs to shorten downtime?

Check your reasoning: No. Follow task-specific authorization and energy controls; only genuinely safe, approved external preparation can move.

METHOD SOURCES / F06: First In, First Out (FIFO) | F12: Single Minute Exchange of Die | S04: OSHA: Control of Hazardous Energy

Supporting lessons and worked methods

Choose a lesson to inspect a worked example, practise a changed case, check the reasoning or plan a facilitated session.

TPS: people, quality and synchronized flow

Muda, mura and muri reinforce each other

Takt, cycle time and lead time are different

Batch transfer versus one-piece flow

Production and withdrawal kanban

Office pull: capacity, blocked work and aging

Heijunka mix and pitch release

Connect processes: flow, bounded FIFO or supermarket

Standardized work: sequence, takt and standard WIP

Manual, walking and machine time

Yamazumi: movable elements and constraints

SMED: externalize safely, verify first good output

Replenishment stock: lead time and uncertainty

PFEP to point-of-use replenishment

TOC five focusing steps

Find the constraint: evidence, not the biggest queue

Drum-buffer-rope: schedule, protect, release

Buffer management: priorities and recurring causes

Throughput versus local utilization

Critical chain: dependencies, resources and buffers

Lean and TOC: complementary questions, distinct controls

Shorten the handoffs

Give the request a clear next step

Supporting lessons / continued

Keep the assembly line ready for the next frame

A clearer start for every cut order

Open the complete learning library