Find the constraint: evidence, not the biggest queue

Use comparable demand and capacity evidence to form a constraint hypothesis, then test it against actual starvation, blocking, quality and release conditions.

The largest queue is a clue, not the conclusion

Fictional three-stage route: A, B and C have supplied comparable effective capacities of 12, 8 and 11 units per hour. Demand is 10 per hour. A snapshot shows the largest visible queue before C, but planner Eli must identify what limits sustained route output under the stated model.

Your role and the reference condition

System analyst working with all three process owners.
Normal: The constraint hypothesis explains system delivery within a defined route, mix and period.
Gap: The team assumes the largest current pile must identify the constraint, without checking its release history.

Work within these conditions

1. Single route, comparable effective capacities, stable stated mix and available demand are supplied assumptions.

2. The snapshot does not prove steady-state behavior or identify the cause of any capacity loss.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

See how the method works

A visible queue is a clue, not a diagnosis. Compare required load with effective capacity over a representative mix and horizon, and observe when processes are starved, blocked or interrupted. In the simple exercise, demand is ten units per hour while stage capacities are twelve, eight and eleven; stage B is the first limiting hypothesis. Real systems need evidence about variability, routing and policies before that conclusion is accepted. The constraint can also be outside the equipment chain, such as demand or an approval rule. Test the hypothesis and recheck it after a material change.

Dashed mark: demand 10 units/hour

Stage	Capacity / hour	Demand / hour
A	12	10
B	8	10
C	11	10

Hypothesis: B. Single route, Comparable effective capacities, Stable stated mix, Demand available. Observe interruptions, starvation, blocking and policy effects.

Method exhibit: Stage A, Stage B, Stage C, Demand.

Follow the evidence and decisions

Inspect the supplied case inputs

Input	Supplied value
Demand	10 units/hour
Stage A capacity	12 units/hour
Stage B capacity	8 units/hour
Stage C capacity	11 units/hour
Queue snapshot	Largest visible queue before C; history unknown
Required observation	Starvation, blocking, quality loss, mix and release

01 / Fix the comparison boundary

Eli confirms that all three capacities refer to the same product route and effective working period. He checks that customer demand is actually available.

Why: Nameplate rates, different mixes or different calendars cannot be compared as if they represent the same opportunity.

Evidence / check: Like-for-like model: 12 / 8 / 11 against demand 10 units/hour.

02 / Form the first hypothesis

B at eight units per hour is the lowest supplied rate and below demand. Under the stated assumptions, it is the first internal constraint hypothesis and the modeled gap is two units per hour.

Why: The arithmetic narrows investigation; it does not by itself establish why B performs at that rate or prove real operating behavior.

Evidence / check: Initial model limit 8/hour; demand gap 2/hour.

03 / Explain the queue without guessing

Inspect when the queue before C arrived, whether it contains held or off-route work, and how release batches were scheduled. Record its age and eligibility.

Why: A queue can reflect earlier releases, quality holds or a temporary event. Its size at one moment does not replace a rate and flow history.

Evidence / check: Queue explanation remains open until arrival, status and service history are checked.

04 / Observe the candidate's actual conditions

Record whether B has ready eligible work, required resources and downstream space. Separate its processing losses from time starved by upstream information or blocked by downstream problems.

Why: The limiting condition may be a policy, supply or quality issue rather than B's equipment itself. Improvement must address the actual mechanism.

Evidence / check: Observation log distinguishes working, starved, blocked and abnormal states with causes to investigate.

05 / Revise the hypothesis when evidence changes

Compare sustained accepted output and demand after a controlled change. If another condition now limits the system, update the focus and supporting rules.

Why: A constraint label is not permanent property of a machine. Persisting with an obsolete label is a decision error.

Evidence / check: System output, demand basis and current evidence support the next decision.

Completed evidence-based hypothesis

Question	Evidence	Conclusion
Lowest comparable rate	B = 8/hour	Initial internal hypothesis
Demand relation	10 required versus 8 modeled	Gap 2/hour
Largest queue	Before C; history unknown	Investigate, do not infer
Observed mechanism	Not yet supplied	Collect state and cause record
Improvement claim	No trial outcome supplied	Keep provisional

B is repeatedly starved

Observation shows B often has no ready material because an upstream release rule batches work late, despite A's average capacity exceeding B's.

Decision

Investigate and test the release/readiness mechanism before assuming more B equipment will solve the loss.

Reasoning

Average capability and timely availability are different. The actual limiting condition may be how work reaches B.

What would change the decision?

Time-stamped starvation and release evidence guide the revised hypothesis.

Practise with a changed case

The slowest stage still has spare capacity

Separate fictional route: X, Y and Z can effectively process 18, 15 and 20 units per hour for the declared mix. Current demand is 12 per hour; a second planning scenario raises demand to 18.

Input	Value
X / Y / Z	18 / 15 / 20 units/hour
Current demand	12/hour
Changed demand	18/hour

Your task

1. State whether Y is binding against current demand under the model.
2. Identify the first internal hypothesis and gap under changed demand.
3. Name two observations needed before deciding an equipment investment.

Use the next page to record your reasoning before reading the answer.

Your practice worksheet

The slowest stage still has spare capacity

Comparable rate basis

Demand boundary

Slowest versus binding distinction

Observed loss states

Provisional decision

Complete your reasoning before turning to the answer. Use the separate learner workbook for group practice.

Check your reasoning and transfer it

1. At demand 12, all supplied capacities exceed demand. Y is slowest but not a binding internal capacity limit against that demand.

2. At demand 18, Y at 15 becomes the first internal hypothesis, with a modeled gap of three units per hour.

3. Check actual mix, readiness, starvation, blocking, quality and policy effects; a capacity purchase requires evidence of the remaining limitation.

Suggested completed record

Scenario	Comparison	Conclusion
Demand 12	Y 15 exceeds 12	No modeled internal shortfall
Demand 18	Y 15 below 18	Hypothesis Y; gap 3/hour
Investment	Mechanism unknown	Observe before committing

Plausible wrong turns

1. The biggest queue is not conclusive constraint evidence.

2. The slowest stage need not limit sales when demand is lower.

Evidence of a sound answer

1. Use demand in the comparison.

2. Retain assumptions and unknown causes.

3. Choose observations capable of changing the hypothesis.

Take the learning back to work

Commitment	Agreed follow-through
Owner	System owner with process and planning representatives
Record	Demand/capacity comparison and time-stamped state observations
Review	After representative observation and every material demand/mix/process change
Verification evidence	An explanatory hypothesis consistent with accepted delivery and loss states
If unresolved	Revisit the boundary, data comparability or policy mechanism before adding capacity.

Help someone else apply the method

Prepare

1. Three stage-rate cards, two demand cards and a queue snapshot
2. State observation sheet

Minutes	Activity and coaching prompt
4	Set the boundary Are these rates genuinely comparable?
7	Choose the first hypothesis Why is the largest queue not enough?
9	Apply the demand-change variant What makes a slow stage become binding?
5	Plan observation Which state would suggest an upstream policy problem?

Debrief

1. Challenge unsupported claims from one snapshot.
2. Ask learners to name the evidence that would change their mind.

Individual or remote practice

Write assumptions before computing the rate comparison, then choose observations that test the suspected mechanism.

Connect the method and check its boundaries

Before application

1. Representative mix and horizon
2. Comparable capacity definitions

Outside this lesson

1. A long queue alone proves nothing
2. The constraint may be market or policy, not equipment

TOCICO: Introduction to TOC

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Define system goal/metrics, constraints and rules before intervention; public synopsis only

Public course synopsis only; no claim to have viewed restricted course content.

Open this lesson and its visual aids