

Capacity Planning in Operations Management



- Process to determine production capacity needed to meet changing demand



- Directly impacts cost, lead time, service level, and profit



- Core tension: undercapacity causes delays vs. overcapacity creates waste



- Program covers concepts, measurement, strategy, methods, execution, risk, and practice



Why Capacity Planning Matters



- Undercapacity: missed sales, delays, stockouts, eroded customer trust



- Overcapacity: idle people and machines, high unused capacity costs



- Links demand forecasting, resource allocation, and S&OP



- Strategic long-term decisions vs. short-term operational adjustments



- Practical: seasonal peaks, new product launches, team workload planning



Core Capacity Concepts



- **Design capacity:** theoretical maximum under ideal conditions



- **Effective capacity:** realistic output after planned losses



- **Actual output:** effective capacity minus unplanned losses



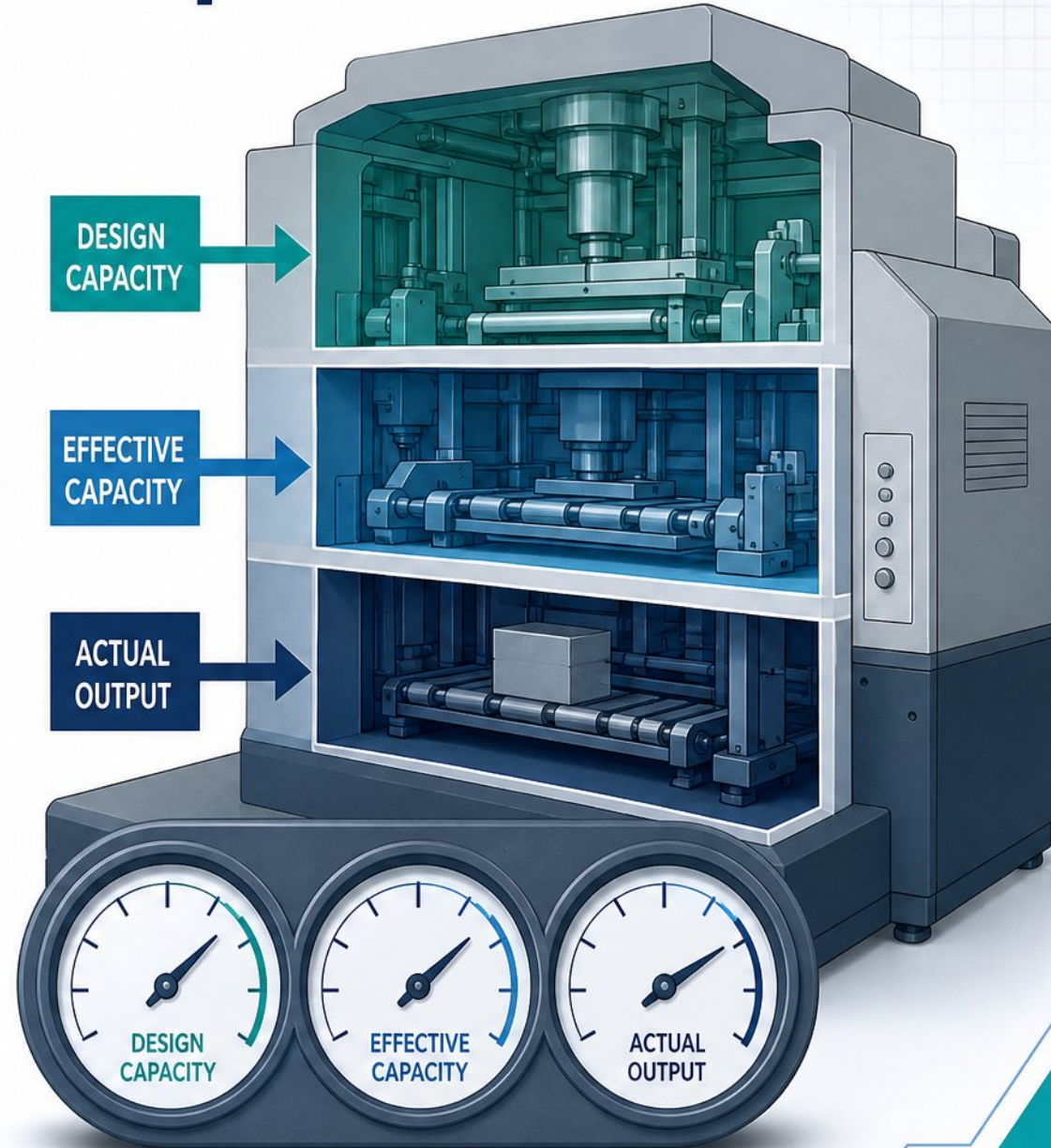
- **Utilization** = Actual Output / Design Capacity



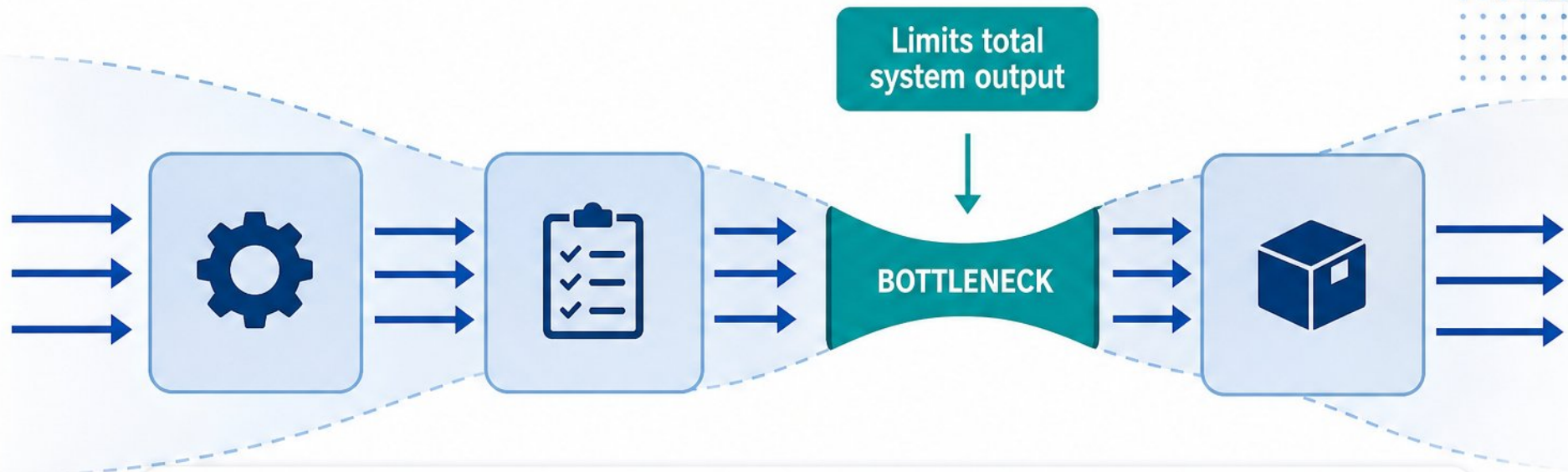
- **Efficiency** = Actual Output / Effective Capacity



- **Throughput (TH)** = WIP / Cycle Time (Little's Law)



Bottlenecks and System Capacity



- Bottleneck: the step with the lowest capacity that limits total system output



- System throughput equals bottleneck capacity, not average capacity



- The Theory of Constraints: improve the constraint first



- Break one constraint, and the next bottleneck appears

Measuring and Modeling Demand



- Demand forecasts are the foundational input for capacity requirements



- Convert demand into required hours using time standards and available hours



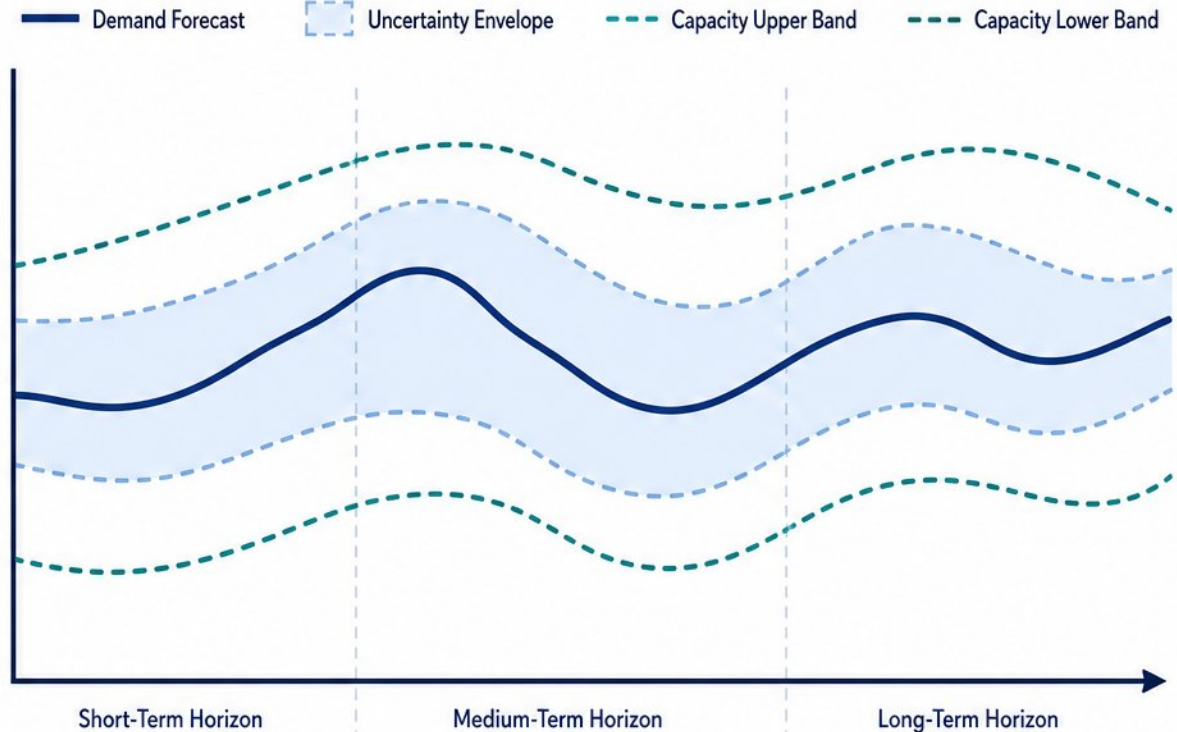
- Address variability, seasonality, and forecast error explicitly



- Use short, medium, and long-term horizons for analysis



- Respond to uncertainty with scenarios, buffers, and frequent review



Monitor Capacity Health



Demand



Utilization



Variability

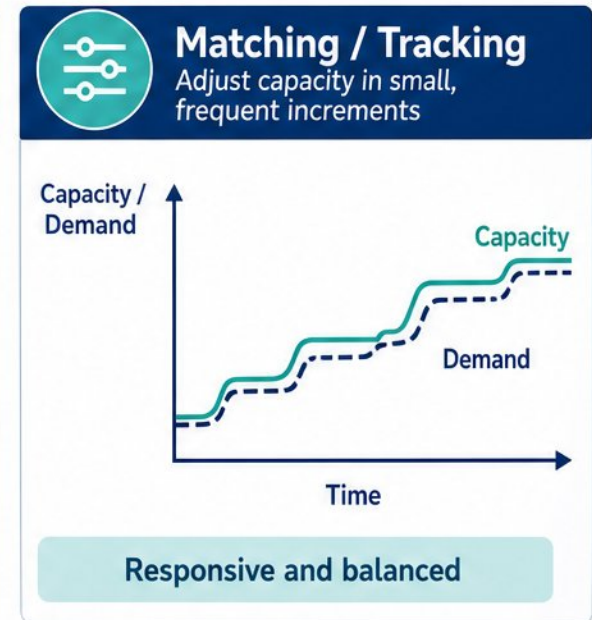


Risk Exposure



Confidence

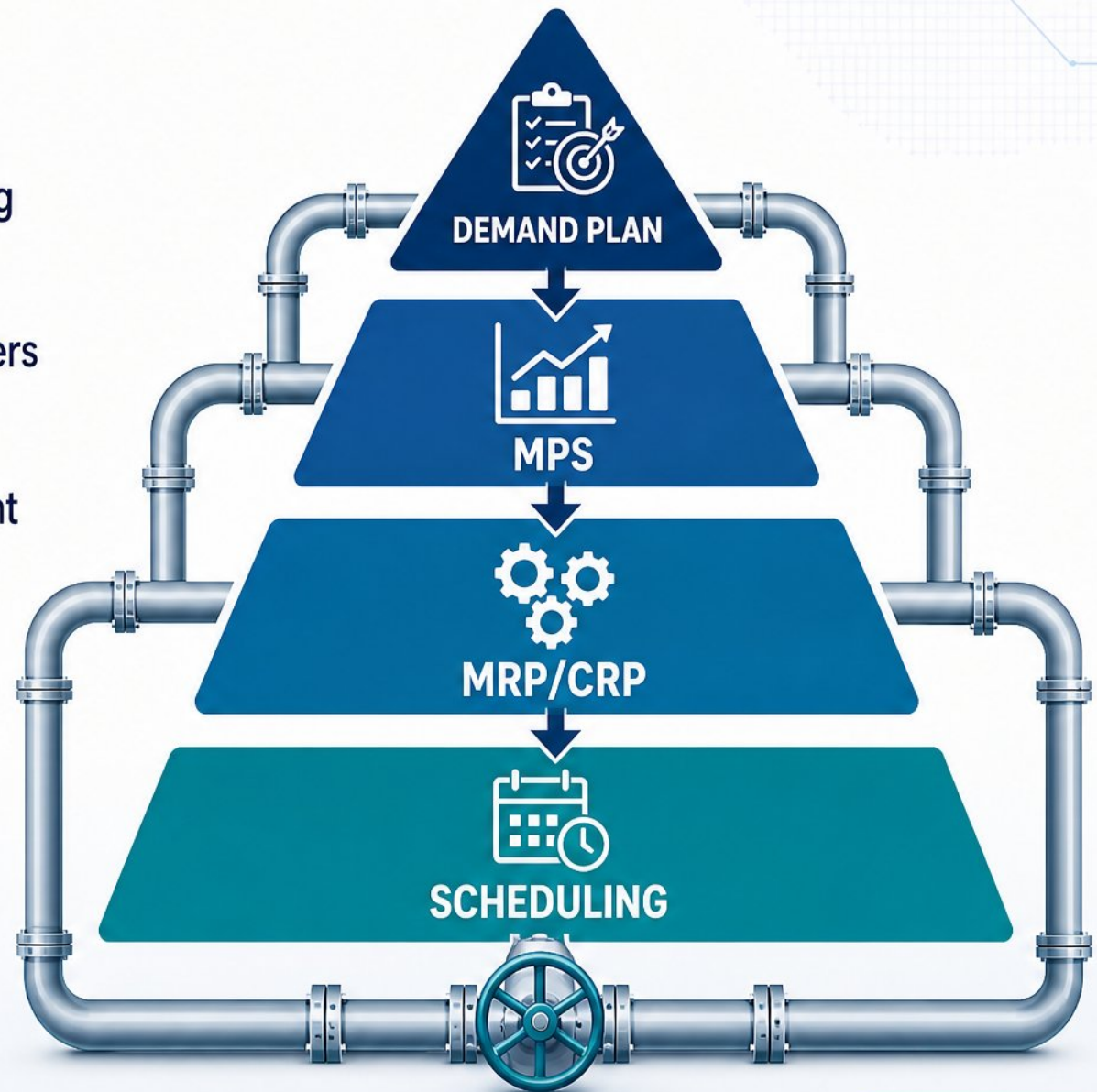
Capacity Strategy and Planning Horizons



- **Lead:** add capacity before demand; higher risk, higher service
- **Lag:** add capacity after demand; lower cost, risk of delays
- **Matching/tracking:** adjust capacity in small, frequent increments
- Long-term strategic (1–5 yrs) vs. short-term operational (days–weeks)
- Make-or-buy, outsourcing, and capacity sharing are strategic levers
- Strategy choice depends on risk tolerance, cost, and market conditions

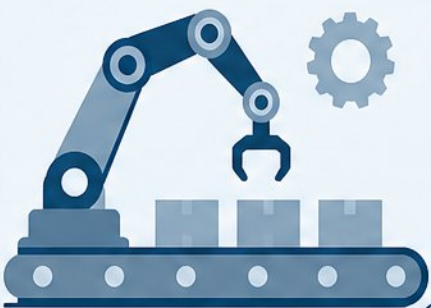
Planning Methods and Tools

- **RCCP:** fast check of critical resources before detailed planning
- **CRP:** detailed validation after MRP, uses routings and work centers
- **Aggregate planning:** 2-12 month horizon for overall capacity alignment
- **Simulation and spreadsheets** support what-if scenarios
- **Hierarchy:** demand plan → MPS → MRP/CRP → scheduling



Capacity Decisions in Services

MANUFACTURING CAPACITY



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CAPACITY CAN BE BUILT, STORED, AND USED LATER

VS.

SERVICE PERISHABLE CAPACITY



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CAPACITY IS PERISHABLE, USE IT OR LOSE IT



- Services are perishable and cannot be inventoried like goods



- Customers are present during delivery, so wait time shapes experience



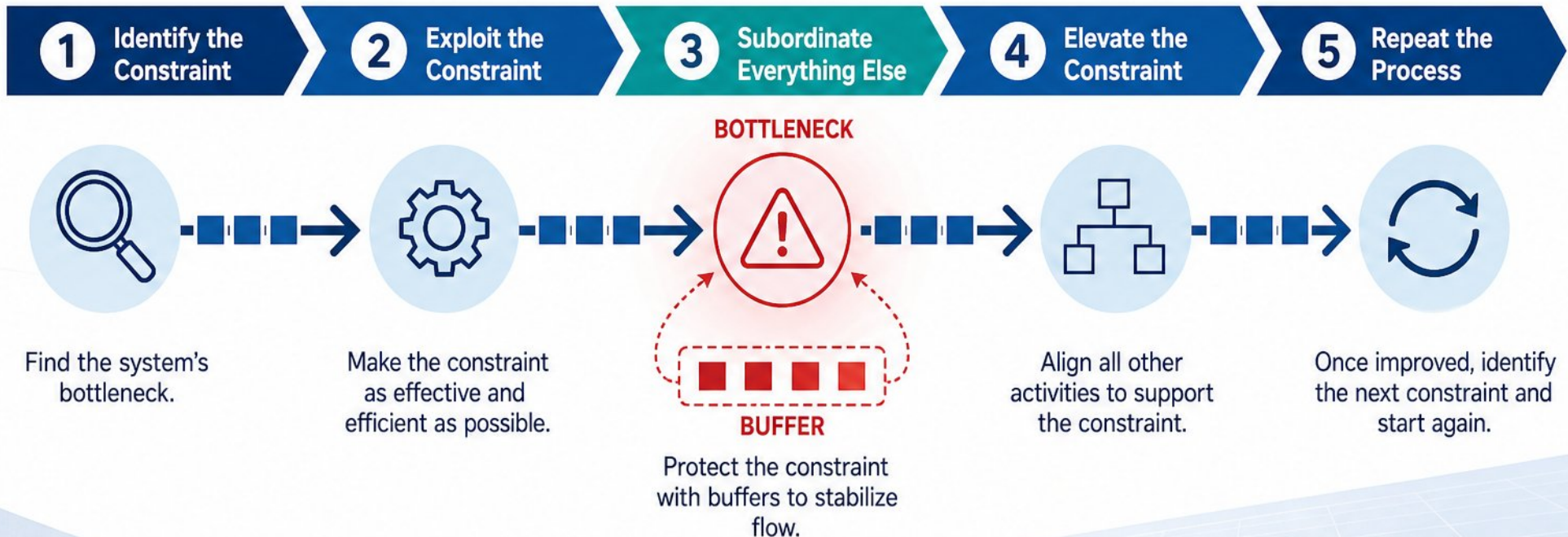
- Shift demand with pricing, scheduling, and peak-time promotion



- Capacity is harder to measure: beds, staff, or seats?

Managing Constraints and Bottlenecks

- Apply the five focusing steps of the Theory of Constraints
- Identify the true constraint; avoid local optimization that doesn't help
- Use buffer management to protect the bottleneck and stabilize flow
- Set improvement priorities based on bottleneck capacity



Capacity Metrics and Performance



- Track utilization, OEE, cycle time, on-time delivery, and backlog together



- Use demonstrated OEE, not rated capacity, for realistic planning



- Target 80-90% utilization on bottleneck resources to protect flow



- High backtracking signals planning gaps, not just execution failures



- Metrics drive resourcing, scheduling, and escalation decisions



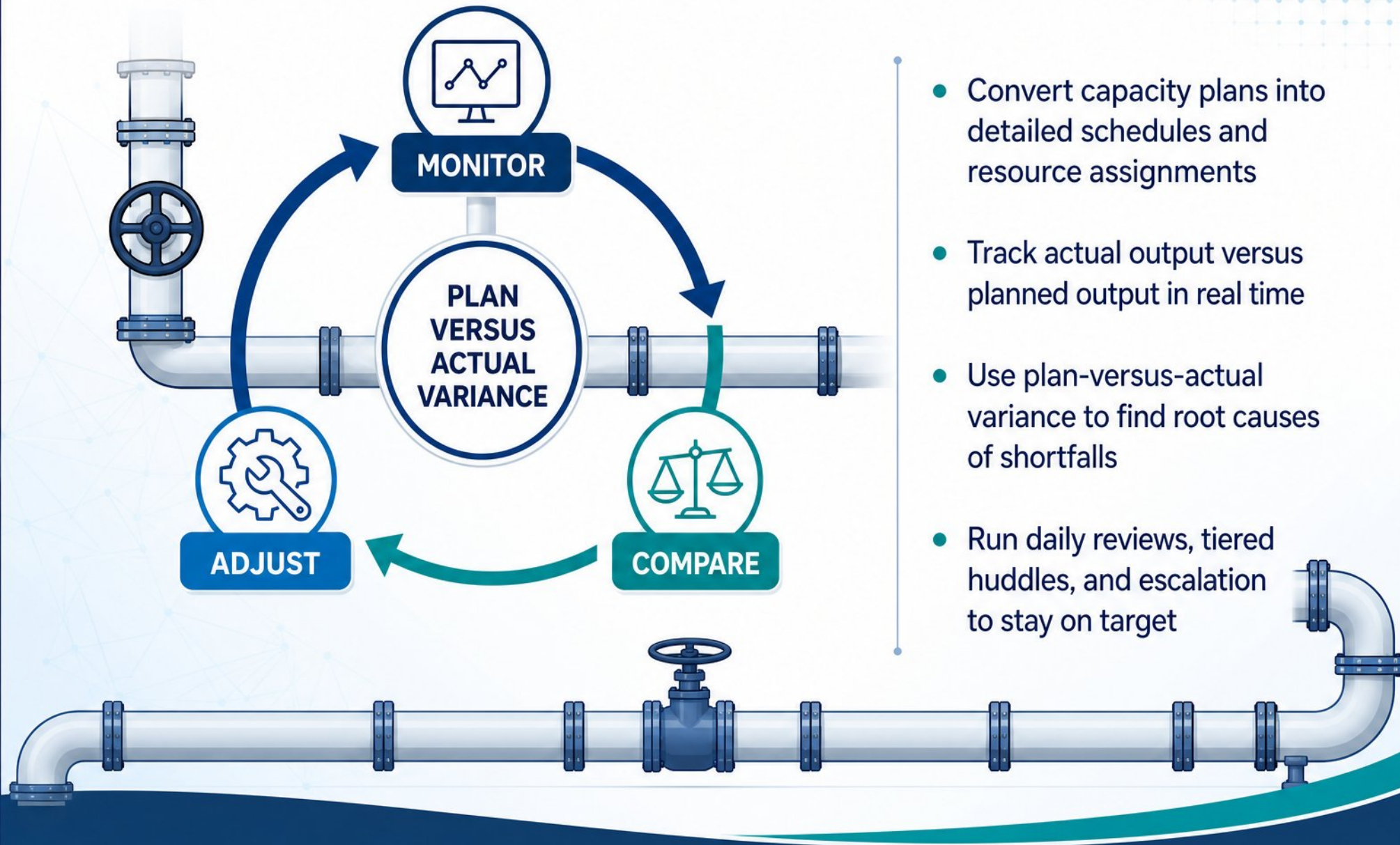
Risk, Uncertainty, and Flexibility



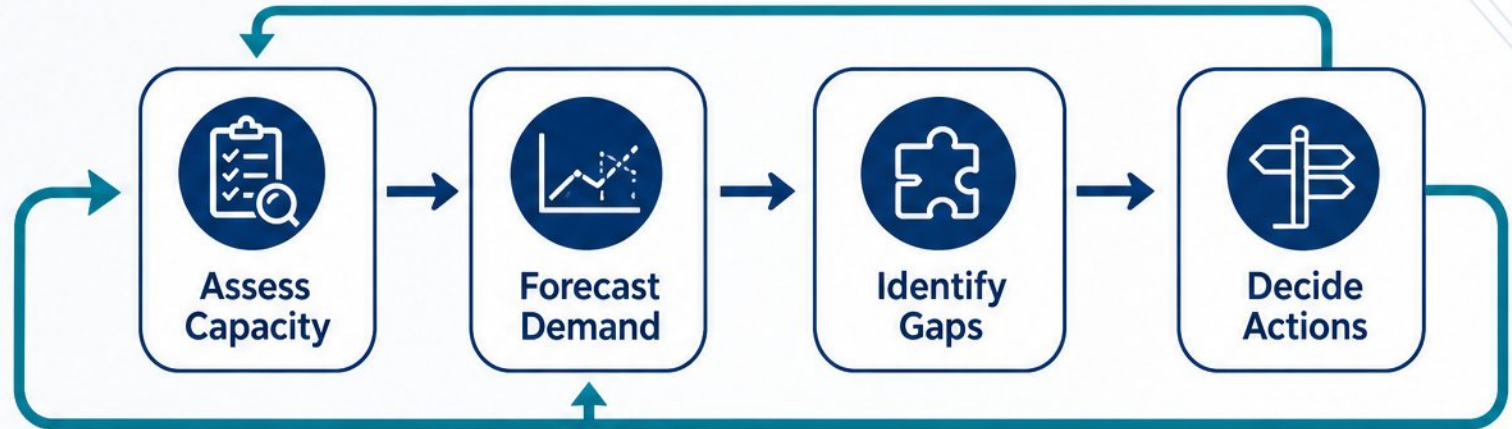
- Demand shocks, supply disruption, absenteeism, and equipment failure create risk
- Fast levers: overtime, shift changes, cross-training, and temp labor
- Scenario planning and safety capacity enable proactive risk responses
- Capacity cushions of 10-20% absorb variability at bottlenecks
- Flexibility instruments help adapt capacity when forecasts are uncertain



From Planning to Execution



Putting Capacity Planning into Practice



- Workflow: assess capacity, forecast demand, identify gaps, decide actions



- Operations checklist: current resources, skills, priorities, weekly reviews



- Avoid 100% utilization, ignored skills gaps, and outdated data



- Use 70-80% utilization target as a buffer for unplanned work



- Continuously monitor actuals vs. plan and update stakeholders

Key Takeaways and Next Steps



- Balance demand with realistic effective capacity, not design capacity



- Use bottleneck analysis, capacity strategy, and flexibility levers



- Measure real capacity and protect the bottleneck



- Build a buffer and review plans regularly



- Apply this workflow to your own team or department



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