Forecasting & S&OP

Across Industry Types

How Chapters 18 & 19 Concepts Apply to:

B2B MANUFACTURING	RETAIL	PURE SERVICE
Intel, Boeing, Caterpillar	*Walmart, Target, Amazon*	*American Airlines, Marriott*

Includes: Industry Deep-Dives + Case Study Activities

Why This Matters for Your Career

In interviews, employers want to know you can APPLY concepts, not just recite formulas. Understanding how forecasting and S&OP differ across industries shows you can think strategically about operations.

B2B MANUFACTURING

Examples: Intel (chips for Dell), Boeing (planes for airlines), Caterpillar (equipment for construction)

Key Characteristics of B2B Manufacturing
- Demand is DERIVED - Intel's demand depends on Dell's demand, which depends on consumers
- Fewer customers but LARGER orders - one contract can be worth millions
- Long lead times - can take months to ramp up production
- Highly skilled workforce - engineers and technicians take years to train
- Demand is often "lumpy" - big orders, then quiet periods

Forecasting in B2B Manufacturing

Method	How It's Used in B2B
Causal/Regression	PRIMARY METHOD - Model demand based on customer production schedules, economic indicators, industry trends. "If auto sales rise 5%, our steel demand rises 7%."
Qualitative	VERY IMPORTANT - Sales teams have direct relationships with buyers. Account managers gather intelligence: "Dell told us they're launching 3 new laptop models in Q3."
Time Series	LESS COMMON - Demand is too lumpy and irregular for simple moving averages to work well.
CPFR	Collaborative Planning, Forecasting & Replenishment - Share forecasts directly with key customers to align production.

S&OP Strategy in B2B Manufacturing

DOMINANT STRATEGY: LEVEL
Maintain stable workforce; use INVENTORY as the buffer

Why Level Strategy Dominates:

- Skilled workers (semiconductor engineers, aerospace technicians) take MONTHS or YEARS to train
- Hiring/firing is extremely expensive and disruptive
- Products can be stored - build inventory during slow periods for peak demand
- Customer contracts often allow backorders with specified penalties (calculable cost)

Key Metrics in B2B Manufacturing:

Metric	Why It Matters
On-Time Delivery %	Contracts specify delivery dates; late penalties can be severe
Inventory Turns	Capital tied up in inventory is expensive; need to balance buffer vs. cost
Capacity Utilization	Expensive equipment (chip fabs cost $20B+) must run efficiently

Real Example: Intel
Intel cannot hire chip fabrication engineers in December for a January demand spike - these roles require years of specialized training. They run a Level strategy, building chip inventory when demand is soft and drawing it down during peak periods. Their S&OP process coordinates with major customers (Dell, HP, Apple) months in advance through collaborative forecasting. When they miss a forecast, the buffer inventory absorbs the shock.

RETAIL

Examples: Walmart, Target, Amazon, Costco, Best Buy

Key Characteristics of Retail

- MILLIONS of SKUs - Walmart carries 120,000+ items per store
- Strong SEASONALITY - back-to-school, holidays, summer
- PROMOTIONS create chaos - a sale can spike demand 500%
- Short product lifecycles - fashion and electronics change constantly
- Real-time POS data - they know EXACTLY what sold yesterday

Forecasting in Retail

Method	How It's Used in Retail
Time Series (Automated)	PRIMARY METHOD - Exponential smoothing with seasonal adjustments runs automatically for millions of SKUs daily. No human could manually forecast this volume.
Promotional Lift Models	Adjust baseline forecast when promotions are planned. "This item normally sells 100/week, but with 20% off it will sell 350."
Demand Sensing	Real-time adjustments based on what's selling NOW. If a product goes viral on TikTok today, replenishment orders go out tonight.
Store-Level Forecasting	Different stores have different demand patterns. A Phoenix store stocks more sunscreen than a Seattle store.

S&OP Strategy in Retail

DOMINANT STRATEGY: CHASE

Flex WORKFORCE to match seasonal demand; manage inventory aggressively

Why Chase Strategy Dominates:

- Workforce is relatively LOW-SKILLED and easy to train (cashiers, stockers)
- Huge seasonal swings - holiday demand can be 3-4x normal
- Holding excess inventory is EXPENSIVE (storage, markdowns, obsolescence)
- Backorder = LOST SALE - customer just goes to competitor down the street

Key Metrics in Retail:

Metric	Why It Matters
Inventory Turnover	COGS / Avg Inventory - Higher = selling faster, less capital tied up
Weeks of Supply	52 / Inventory Turnover - How many weeks until stockout at current sales rate
In-Stock %	% of time item is available - stockouts = lost sales and unhappy customers
GMROI	Gross Margin Return on Inventory - profit generated per dollar of inventory

Real Example: Amazon

Amazon hires 100,000+ seasonal workers every holiday season - pure Chase strategy. Their forecasting algorithms incorporate search data, browsing patterns, weather forecasts, and social media trends. They pre-

position inventory across fulfillment centers based on predicted regional demand. If their algorithm predicts you'll order a product, it might already be in a truck heading your direction before you click "Buy."

Real Example: Walmart's Retail Link
Walmart shares real-time POS data with suppliers through their Retail Link system. Suppliers can see exactly how their products are selling at every store. This enables collaborative forecasting - P&G knows to ship more Tide to Store #4521 before Walmart even places an order. The forecasting runs exponential smoothing with promotional lift factors for thousands of items.

PURE SERVICE

Examples: American Airlines, Marriott Hotels, Enterprise Rent-A-Car, hospitals, concert venues

Key Characteristics of Pure Service
- CANNOT INVENTORY capacity - empty seat on today's flight is GONE FOREVER
- Capacity is relatively FIXED - can't easily add planes or hotel rooms
- Must forecast by TIME SLOT - not just "how many passengers this month"
- No-shows and cancellations add uncertainty
- High FIXED costs, low VARIABLE costs (plane flies whether full or empty)

THE CRITICAL DIFFERENCE

In manufacturing and retail, if you don't sell today, the product is still there tomorrow.
In services, if you don't sell today, that capacity VANISHES.

An empty hotel room tonight cannot be sold tomorrow. The night has passed.

Forecasting in Pure Service

Method	How It's Used in Services
Time Series + Seasonality	Day of week, time of day, holidays, local events all matter. Friday flights are different from Tuesday flights.
Booking Curves	Track how reservations build over time. "Flight 247 usually has 50 bookings 30 days out. Today it has 80. Raise prices!"
Segmentation Forecasting	Separate forecasts for business vs. leisure travelers - they book differently and have different price sensitivities.
No-Show Prediction	Model cancellation/no-show rates to determine overbooking levels.

S&OP Strategy in Pure Service

DOMINANT STRATEGY: YIELD MANAGEMENT
Adjust PRICE dynamically to match demand to fixed capacity

Why Traditional Strategies DON'T Work:

- LEVEL strategy impossible - cannot inventory an airline seat for next week
- CHASE strategy limited - cannot easily add planes or build hotel rooms overnight
- Instead: Use PRICE as the lever to shift demand to match capacity

Yield Management Tactics:

Tactic	Example
Dynamic Pricing	Flight price changes based on demand, time to departure, competitor prices
Overbooking	Sell 105 seats on a 100-seat plane, anticipating 5 no-shows
Rate Fences	Saturday night stay requirement for cheap hotel rate (blocks business travelers)
Demand Shifting	Off-peak discounts: "Fly Tuesday instead of Friday and save $200"

Key Metrics in Services:

Metric	Formula/Meaning	Industry
Load Factor	% of seats filled	Airlines
RevPAR	Revenue Per Available Room	Hotels
RASM	Revenue per Available Seat Mile	Airlines
Utilization Rate	% of capacity being used	Car Rental, Hospitals

Real Example: American Airlines (Pioneers of Yield Management)
American Airlines invented yield management in the 1980s to compete with low-cost carriers. They forecast demand for EACH FLIGHT by fare class. As departure approaches, prices adjust dynamically. If business travelers are booking fast, prices rise. If a flight looks empty, last-minute deals appear. They overbook by ~5-15% based on historical no-show rates for that route. The goal: maximize Revenue per Available Seat Mile (RASM), not just fill seats.

SIDE-BY-SIDE COMPARISON

This is your quick-reference guide for interviews and exams:

Dimension	B2B Manufacturing	Retail	Pure Service
Primary Forecast Method	Causal/Regression + Qualitative	Time Series (automated)	Time Series + Booking Curves
Forecast Granularity	By customer/contract	By SKU/store/week	By time slot/seat/room
Biggest Challenge	Lumpy demand, long lead times	Promotions, millions of SKUs	Perishability, no-shows
Dominant S&OP Strategy	LEVEL (skilled workforce)	CHASE (flexible labor)	YIELD MANAGEMENT (price)
Can Hold Inventory?	YES - major buffer	YES - but costly	NO - capacity perishes
Backorder Possible?	YES (with penalties)	Rarely (lost sale)	NO (moment passes)
Most Important Cost	Inventory holding	Lost sales/markdowns	Unfilled capacity
Key Metric	On-time delivery %	Inventory turnover	RevPAR, Load Factor
Workforce Flexibility	LOW (specialized)	HIGH (seasonal hiring)	MEDIUM (scheduling)

MODEL INTERVIEW ANSWER

Q: "How would forecasting differ at Procter & Gamble vs. Delta Airlines?"

A: "At P&G, they're forecasting consumer product demand across thousands of SKUs - heavy time series with promotional adjustments, feeding into production planning. They can build inventory during slow periods. At Delta, they forecast demand for specific flights on specific dates. The critical difference is perishability: P&G can store unsold Tide for next month, but Delta can't store an empty seat. That's why Delta uses yield management - adjusting prices dynamically - rather than traditional production planning. Their 'inventory' expires the moment the plane takes off."

CASE STUDY ACTIVITIES

Work through these scenarios to apply what you've learned. For each case, recommend the appropriate forecasting method(s) and S&OP strategy.

Case 1: Nike Sneaker Launch

THE SITUATION:
Nike is launching a new signature basketball shoe with LeBron James. This is a completely new product with no sales history. The shoe will be sold through Nike.com, Nike stores, Foot Locker, and Dick's Sporting Goods. Launch is planned for August (back-to-school season). Manufacturing is done in Vietnam with a 4-month lead time.

QUESTIONS TO ANSWER:
1. What forecasting method(s) would you recommend and why?
2. What S&OP strategy should Nike's manufacturing partner use?
3. What are the biggest risks if Nike over-forecasts? Under-forecasts?
4. What data would help improve the forecast?

SUGGESTED ANSWER:
1. QUALITATIVE methods dominate: Historical analogy (how did previous LeBron shoes launch?), market research (social media buzz, pre-orders), panel consensus from sales and marketing. Time series is useless - no history exists for this specific product.
2. LEVEL strategy for manufacturing - skilled footwear workers are specialized. Use inventory as buffer. Build to forecast, hold safety stock for demand uncertainty.
3. Over-forecast risk: Excess inventory requiring markdowns, hurting brand image ("clearance LeBrons" looks bad). Under-forecast risk: Stockouts, lost sales, scalpers reselling at 3x price (customer frustration), social media backlash.
4. Pre-order data, social media sentiment analysis, Google Trends for "LeBron shoes," retailer buyer commitments, comparison to similar past launches (other signature shoes).

Case 2: Southwest Airlines Spring Break

THE SITUATION:
Southwest Airlines is planning for Spring Break 2026 (March 7-22). They operate the Dallas to Cancun route with 4 daily flights on Boeing 737s (175 seats each = 700 seats/day). Historically, Spring Break demand exceeds capacity. They cannot add more flights due to gate constraints in Cancun. Last year's load factor hit 98% with average ticket price of $450.

QUESTIONS TO ANSWER:
1. Why can't Southwest use a traditional Chase or Level strategy here?
2. What yield management tactics should they employ?
3. Should they overbook? What's the risk?
4. How would their approach differ for the Dallas-Omaha route (lower demand)?

SUGGESTED ANSWER:
1. Chase: Can't hire more planes/pilots overnight. Level: Can't inventory seats - empty seat today is gone. Capacity is FIXED at 700 seats/day due to gate constraints. Only lever is PRICE.
2. Dynamic pricing (raise prices as March approaches and seats fill), early booking discounts (lock in leisure travelers early), fare classes (limited discount seats, more full-fare), peak vs. off-peak pricing within Spring Break dates (March 15 vs. March 8).
3. Yes, overbook by ~3-5% based on historical no-show data for leisure routes. Risk: Spring Break travelers actually show up (unlike business travelers). Being bumped from your Cancun vacation creates HUGE customer anger. Keep overbooking conservative.
4. Dallas-Omaha has excess capacity, so offer discounts to STIMULATE demand. Different problem: fill empty seats at lower prices vs. maximize revenue from scarce capacity.

Case 3: Caterpillar Mining Equipment

THE SITUATION:
Caterpillar makes massive mining trucks ($5M each) sold to mining companies like BHP and Rio Tinto. A single truck takes 6 months to manufacture. Their workforce includes specialized welders and heavy equipment engineers who require 18+ months of training. Demand is heavily tied to commodity prices - when copper prices rise, mining companies order more trucks.

QUESTIONS TO ANSWER:
1. What forecasting method(s) would be most appropriate?
2. Why would exponential smoothing be a poor choice here?
3. What S&OP strategy makes sense given the workforce constraints?
4. How might Caterpillar handle a sudden surge in orders when copper prices spike?

SUGGESTED ANSWER:
1. CAUSAL/REGRESSION: Model demand as function of commodity prices, mining industry capital expenditure forecasts, customer order pipelines. QUALITATIVE: Direct customer relationships - sales reps talk to BHP's purchasing team and know their 3-year expansion plans.
2. Demand is too LUMPY - BHP might order 20 trucks, then nothing for 2 years. Time series assumes regular patterns. Also, demand depends on external variable (commodity prices), not just historical patterns.
3. LEVEL strategy - cannot hire/fire specialized welders quickly. Train continuously, maintain stable workforce, use inventory as buffer. Production lead time (6 months) allows time to adjust schedules based on order pipeline.
4. Options: Overtime (expensive but preserves workforce stability), backorders with defined delivery dates and penalties, subcontracting components (not full assembly). Cannot easily Chase - hiring takes 18 months to see results.

Case 4: Target Back-to-School

THE SITUATION:
Target is planning for back-to-school season (July 15 - September 15). They stock 5,000+ school supply SKUs across 1,900 stores. Demand varies dramatically by region (Texas schools start August 1, New York starts September 5). Last year, some stores sold out of popular items by August 10 while others had excess inventory requiring 50% markdowns.

QUESTIONS TO ANSWER:
1. Why is store-level forecasting critical here?
2. What forecasting approach should Target use for a new "viral" backpack style?
3. How should Target handle workforce planning for this seasonal peak?
4. What's worse: stockouts or excess inventory? How does this inform the forecast bias?

SUGGESTED ANSWER:
1. School start dates vary by 5+ weeks across regions. A national forecast would stock Austin stores too late and NYC stores too early. Must forecast BY STORE or at least by region, aligned to local school calendars.
2. QUALITATIVE (no history) + demand sensing (watch social media mentions, early sales velocity). Historical analogy from similar past trends. Be ready to chase demand - have expedited supply chain options.
3. CHASE strategy - hire seasonal workers, increase hours. Retail workforce is relatively low-skilled and quick to train. Standard retail approach to seasonal peaks.
4. STOCKOUTS are worse - parent buys at Walmart instead, and you've lost the sale forever. Excess inventory can be marked down (some recovery) or held for next year (school supplies don't expire). Bias toward slight OVER-forecasting for must-have items.

Case 5: Marriott Convention Hotel

THE SITUATION:
The Marriott Marquis in San Francisco has 1,500 rooms and hosts large conventions. The Salesforce Dreamforce conference (September 15-18) books 800 rooms. A medical conference (September 17-20) wants 400 rooms but at a lower rate. Leisure travelers book the remaining rooms sporadically. Standard rate is $350/night, but Dreamforce negotiated $290/night due to volume. The medical conference offered $260/night.

QUESTIONS TO ANSWER:
1. Should Marriott accept the medical conference rate of $260/night?
2. What forecasting data would help make this decision?
3. What yield management tactics apply to the remaining 300 rooms?
4. How should Marriott plan housekeeping staff for this period?

SUGGESTED ANSWER:
1. DEPENDS on forecast for those dates. If leisure/individual business demand can fill rooms at $350, reject the $260 offer. If forecast shows 300 rooms would sit empty, accept $260 (better than $0 - perishable!). Key question: what's the opportunity cost?
2. Historical booking patterns for mid-September, current booking pace vs. prior years, local events calendar, competitive set pricing, economic indicators for business travel.
3. Dynamic pricing (raise rates as September approaches if filling fast), minimum stay requirements (3-night minimum), rate fences (non-refundable discount rate), last-minute deals if rooms remain empty.
4. Forecast says 1,200+ rooms occupied = full housekeeping staff needed. Use STABLE WORKFORCE WITH VARIABLE HOURS - overtime and extra shifts. Maybe hire temporary staff for this peak (modified Chase). Can't inventory clean rooms!

KEY TAKEAWAY FOR INTERVIEWS

The "right" forecasting method and S&OP strategy depends on the industry context.

Always ask: Can they inventory? How skilled is the workforce? How perishable is capacity?

Show interviewers you can THINK, not just recite formulas.