SALES, INVENTORY AND
OPERATIONS PLANNING

NERVE CENTER

See What's Really Going On in Your Company — and Do Something About It



ONE PLAN, EVERY MONTH

BILL CANADY

Bestselling author of The 80/20 CEO

The figures and the pages for your team

This visual companion is included with the audiobook of Nerve Center: See What's Really Going On in Your Company — and Do Something About It, by Bill Canady.

Keep it beside you when the narration describes a figure or asks your team to put a number, an owner or a date on paper. It contains all twenty-four figures, in chapter order, followed by the complete Put It to Work section from the current first edition.

The worksheets in these pages are the short starting set. Nerve Center · The Field Guide, sold separately, contains the complete set of thirty-nine worksheets with Riverton's worked examples, plus the additional meeting and rollout tools.

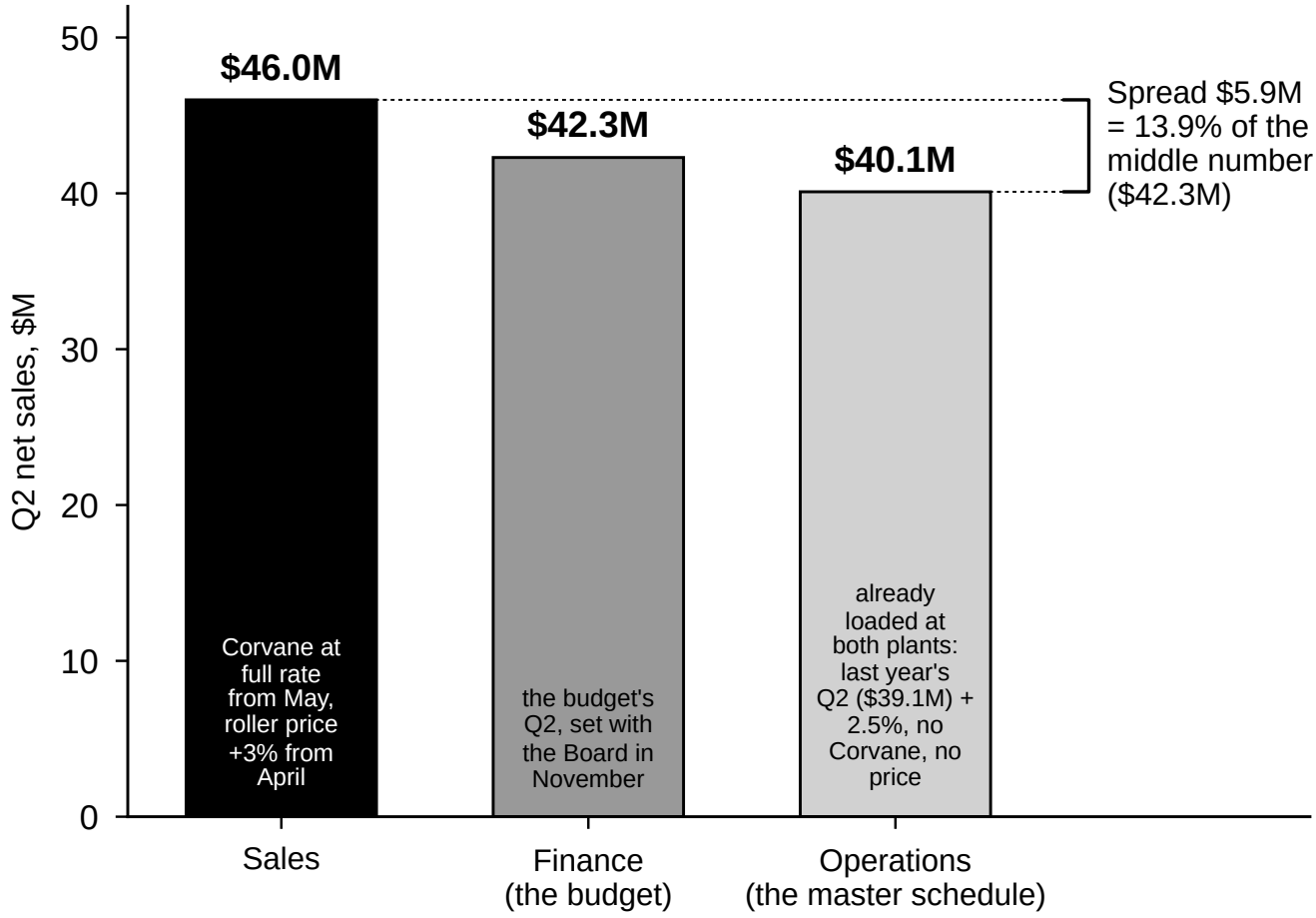
The figures, forms and reference tables match the first edition. Riverton Industrial Products and the other company names and numbers are illustrative, as explained in the book.

Figures: companion pages 3–26. Put It to Work: pages 27–34 (book pages 151–158). Five populated reference tables: pages 35–39. Glossary: pages 40–50. Notes on Sources: pages 51–57.

Use the included glossary and source notes when you want a definition or the background behind an example. These reference sections are not read as separate audiobook chapters.

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Figure 1.1

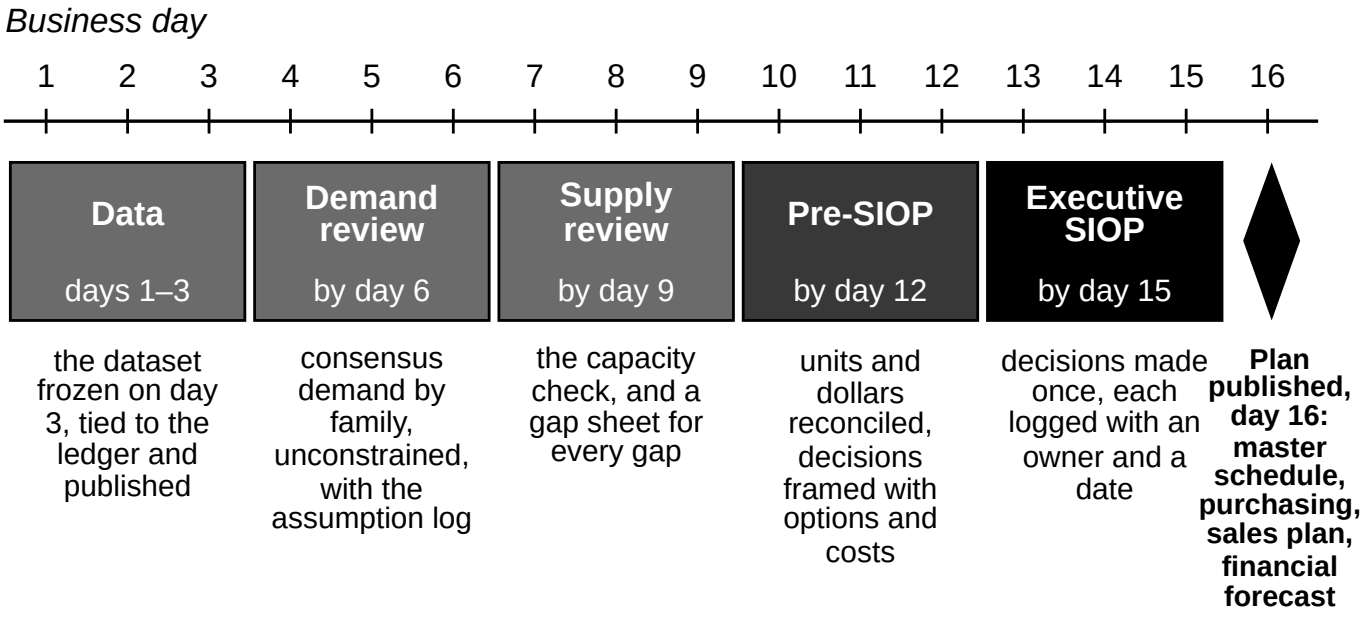


Over 5%: more than one company. Over 10%: the plants are building to one of them.

Three numbers for one quarter: Riverton's second quarter as Sales, Finance and Operations each put it on February 20 — $46.0 million, $42.3 million and $40.1 million, a spread of $5.9 million, or 13.9 percent of the middle number.

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Figure 1.2

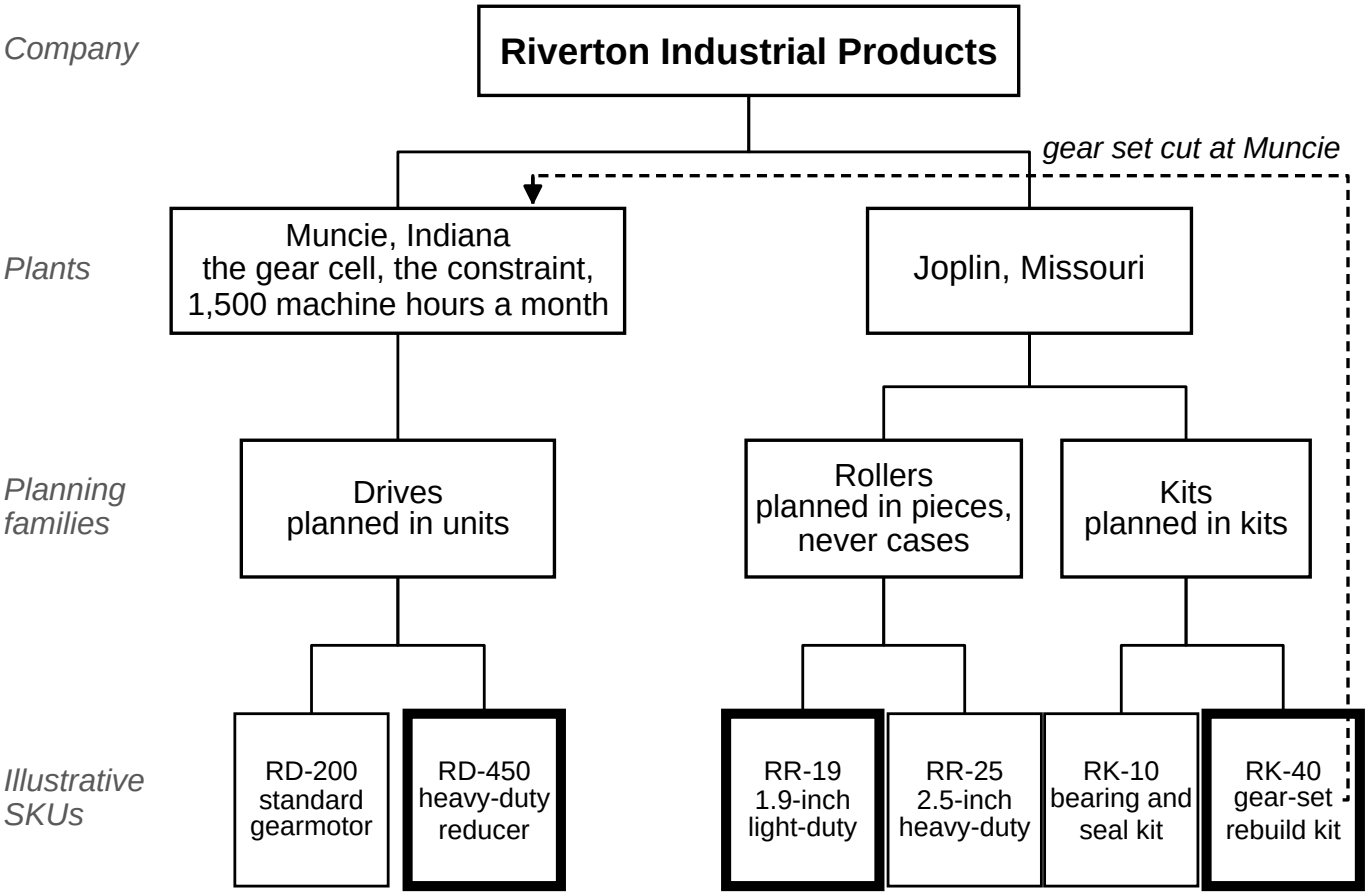


The plan: 18 months, units and dollars, to the gross margin line

The SIOP month: a data step and four meetings across about three weeks of business days, each step producing what the next one needs, and together one plan for eighteen months, in units and dollars, to the gross margin line.

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Figure 2.1

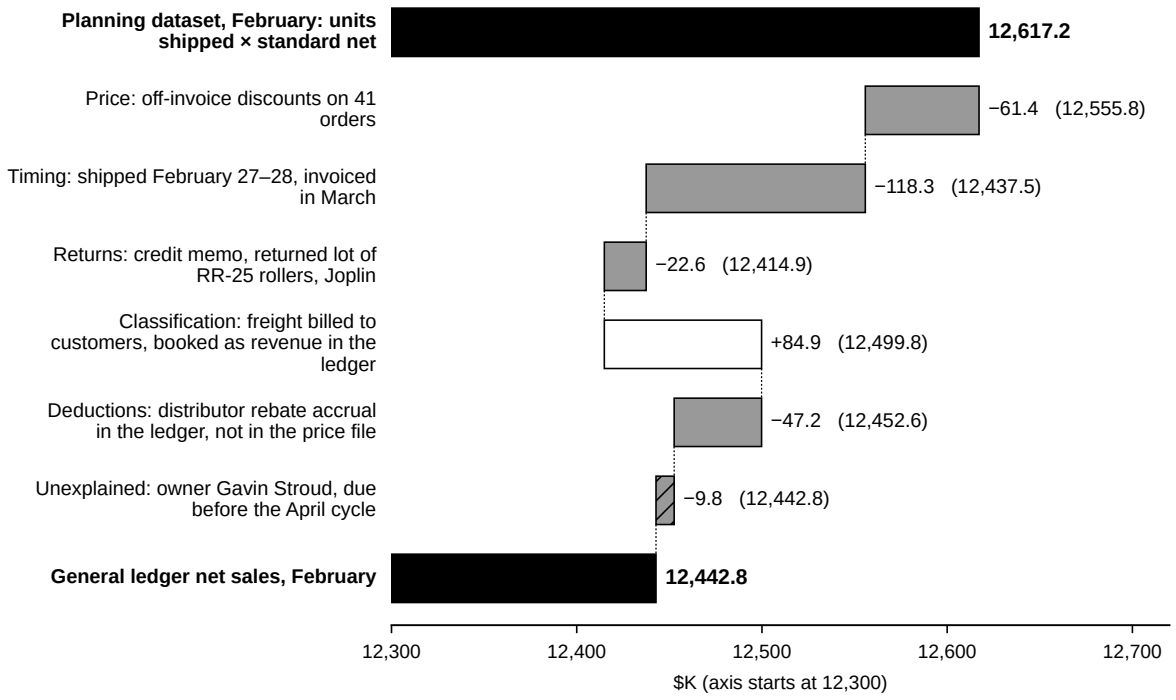


Each family has many more SKUs. The plan is made by family.

How Riverton plans: two plants, three planning families with one unit of measure each, and six illustrative SKUs, three of them taken below the family as exceptions.

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Figure 2.2

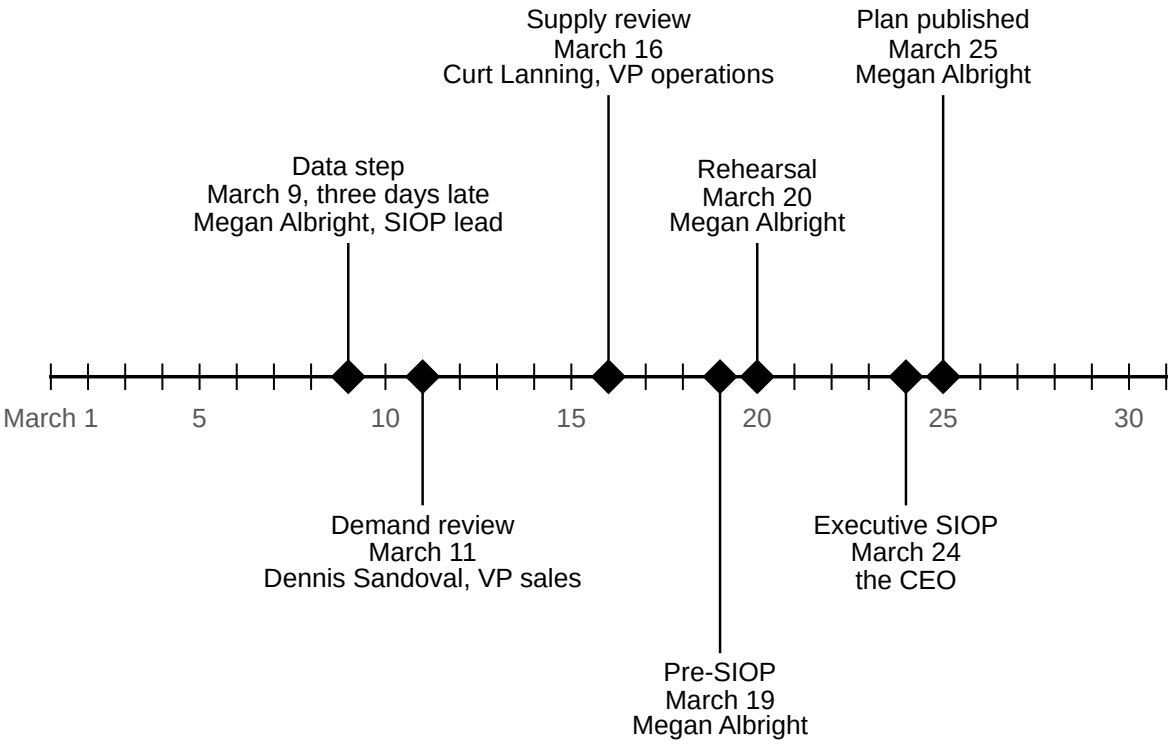


Planning dataset 12,617.2 = Drives 3,601 × $1,600 (5,761.6) + Rollers 91,200 × $48.00 (4,377.6) + Kits 16,520 × $150.00 (2,478.0). Difference 174.4: 164.6 explained, 9.8 owned.

February, tied to the ledger: Riverton's planning dataset of $12,617.2K walked to general ledger net sales of $12,442.8K in six named lines, the last one unexplained, owned and dated.

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Figure 3.1



The standard calendar, in business days: data by day 3 · demand review by day 6 · supply review by day 9 · pre-SIOP by day 12 · executive SIOP by day 15 · plan published on day 16

Riverton's first cycle on the March calendar, set from a dataset that arrived three days late, with one owner for every step and every published date held.

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Figure 3.2

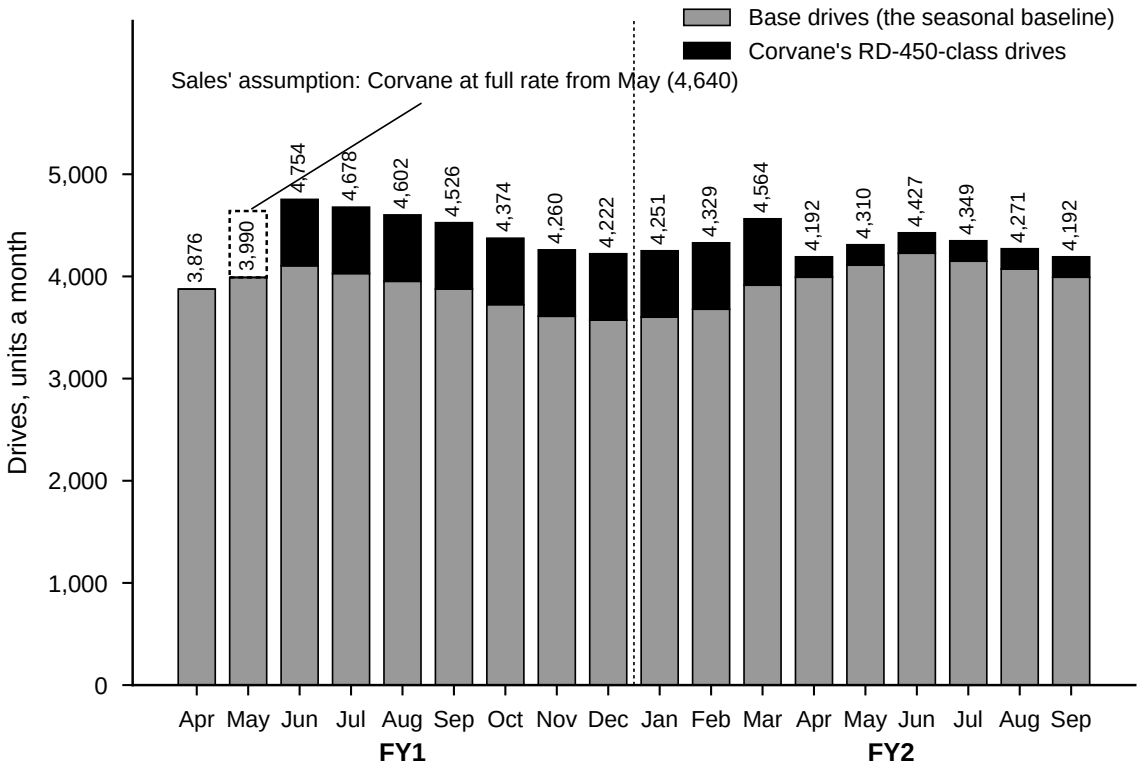
	CEO	CFO	VP sales	VP operations	SIOP lead	Demand planner	Supply planner	Finance partner	Plant managers
Volume plan	I	C	**A**	I	I	**R**	I	C	I
Price and deductions	I	C	**A**	I	I	C		**R**	
Supply plan	I	I	I	**A**	I	I	**R**	C	C
Inventory targets	I	C	C	**A**	I	I	**R**	I	C
Financial plan	I	**A**	C	C	I	I	I	**R**	I
Pre-SIOP	I	C	C	C	**A**	**R**	**R**	**R**	I
Final approval	**A**	C	C	C	**R**	I	I	I	I
The process	C	C	C	C	**A**	**R**	**R**	**R**	I

One A per row. *R responsible · A accountable · C consulted · I informed · blank: none of that seat's business*

Riverton's RACI, eight rows by nine seats, with one name in the A column of every row.

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Figure 4.1

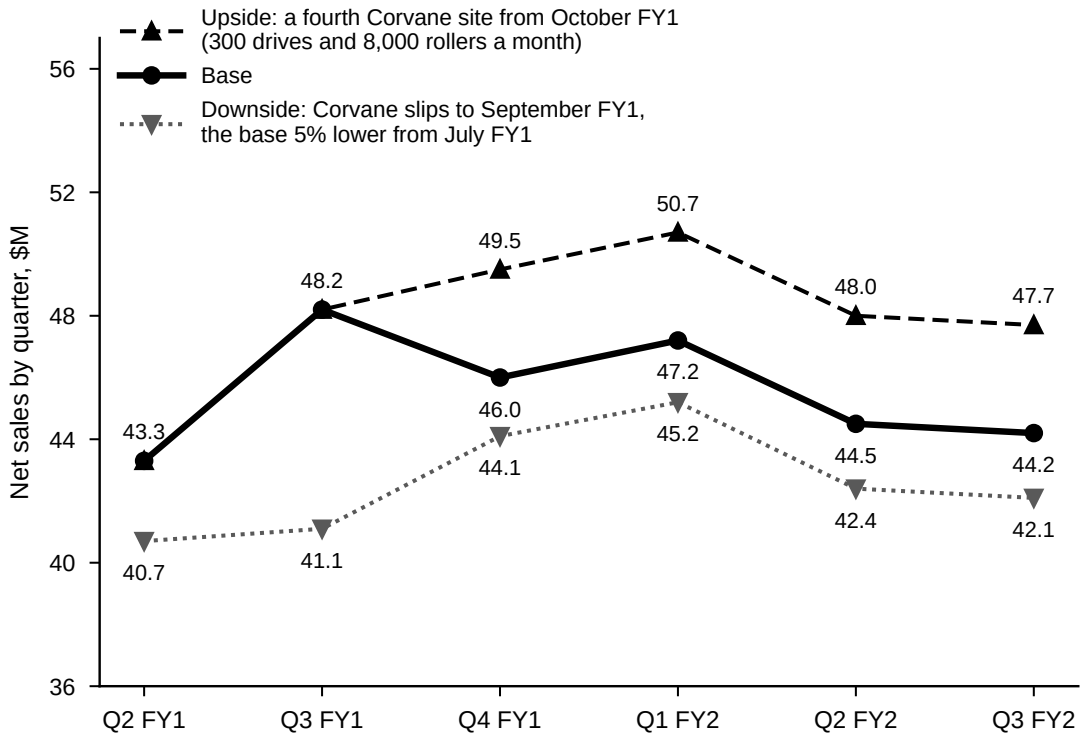


Base drives average 3,800 a month in FY1 and 3,914 in FY2. Corvane: 650 a month from June through March, then 200 a month for spares and service.

Drives demand in the March cycle, April this year through September next year: the seasonal baseline, Corvane's drives stacked on top from June, and the May start Sales had assumed.

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Figure 4.2

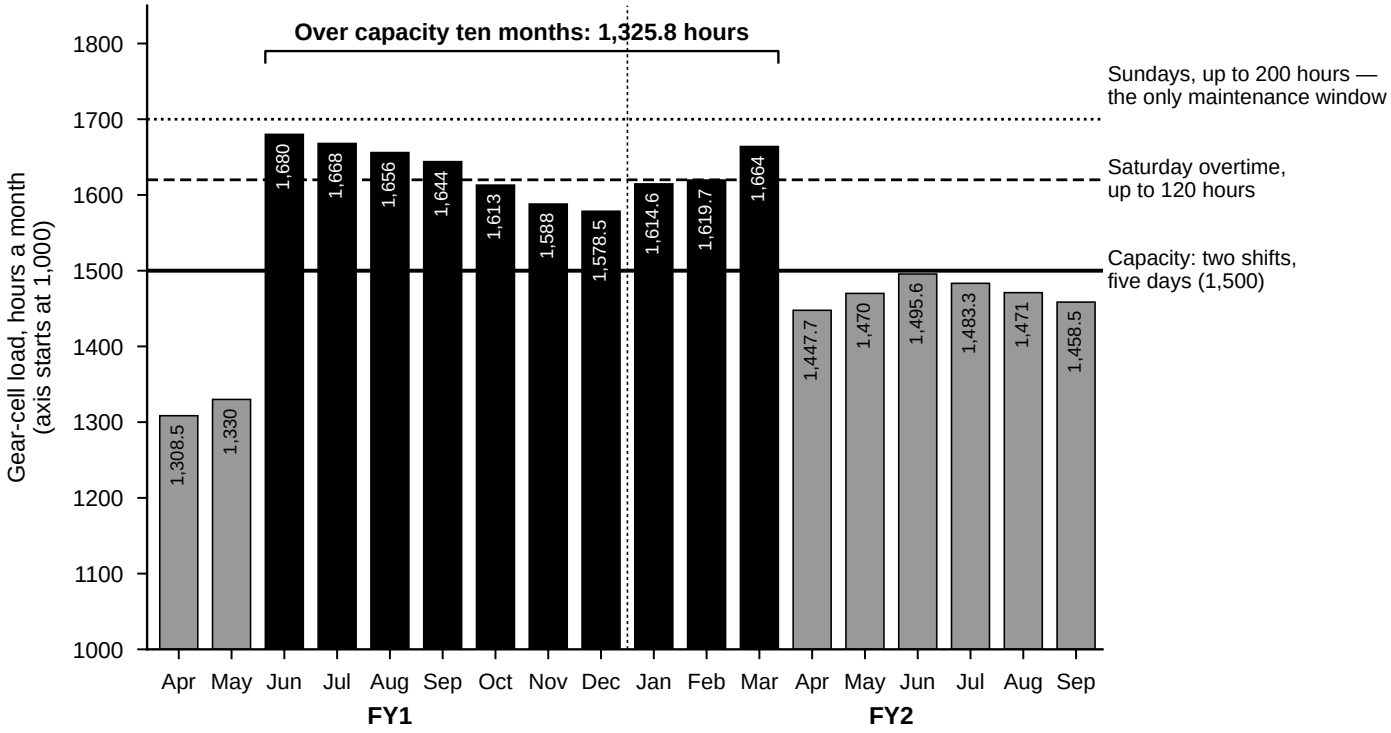


Eighteen months: base $273.4M of net sales and $84.7M of gross margin · upside $287.3M and $88.3M · downside $255.7M and $79.5M. FY1 net sales: base $175.5M, upside $178.9M, downside $163.9M, against the FY1 budget of $165.0M.

Base, upside and downside: Riverton's net sales by quarter in the March cycle, from the second quarter this year through the third quarter next year, with each case's eighteen-month total.

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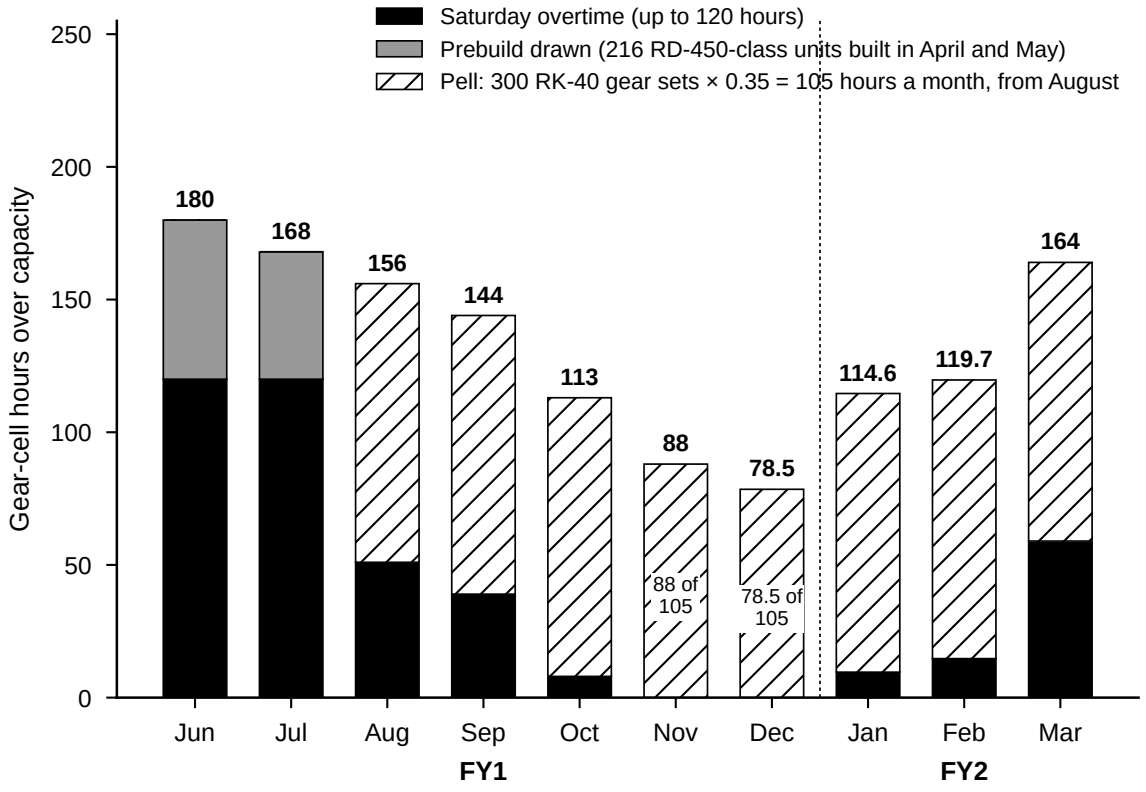
Figure 5.1



Load against capacity at the Muncie gear cell in the March cycle. The cell runs over its 1,500 hours from June through March next year, 1,325.8 hours in all, and falls back under from April next year.

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Figure 5.2

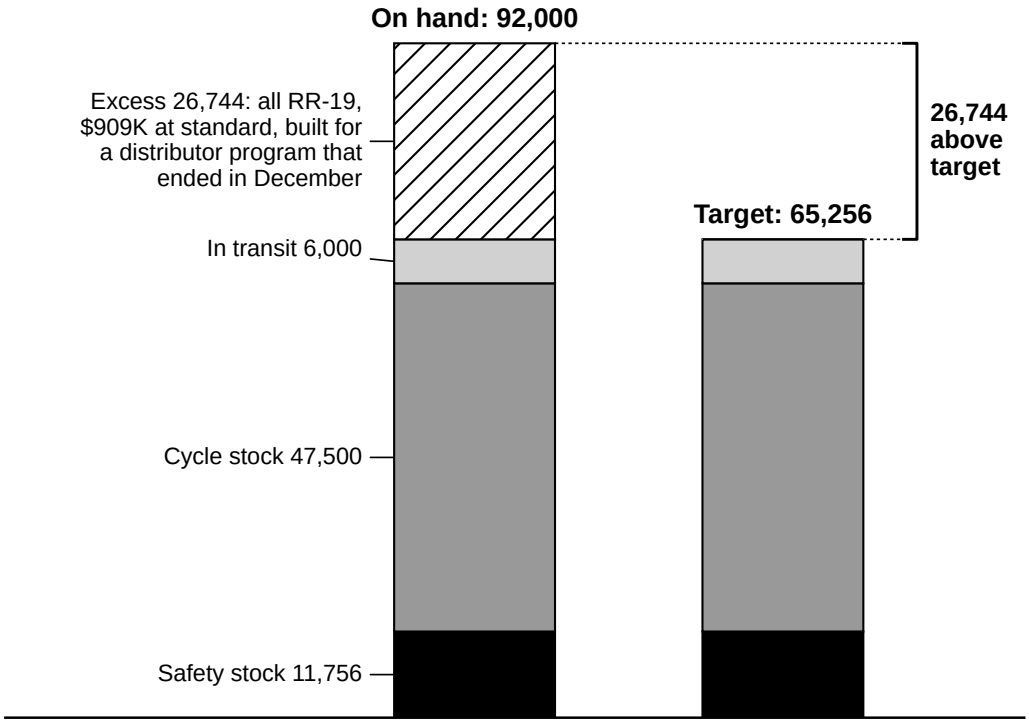


The gap: 1,325.8 hours over ten months, closed without a Sunday. Overtime 421.3 hours, $40K. Pell 2,400 sets, $144K. Carrying $11.5K. Total $196K, $133.6K of it in FY1.

How the gap closes under Option 3: Saturday overtime first, the spring prebuild for June and July, Pell's 105 hours a month from August, and no Sundays.

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Figure 6.1

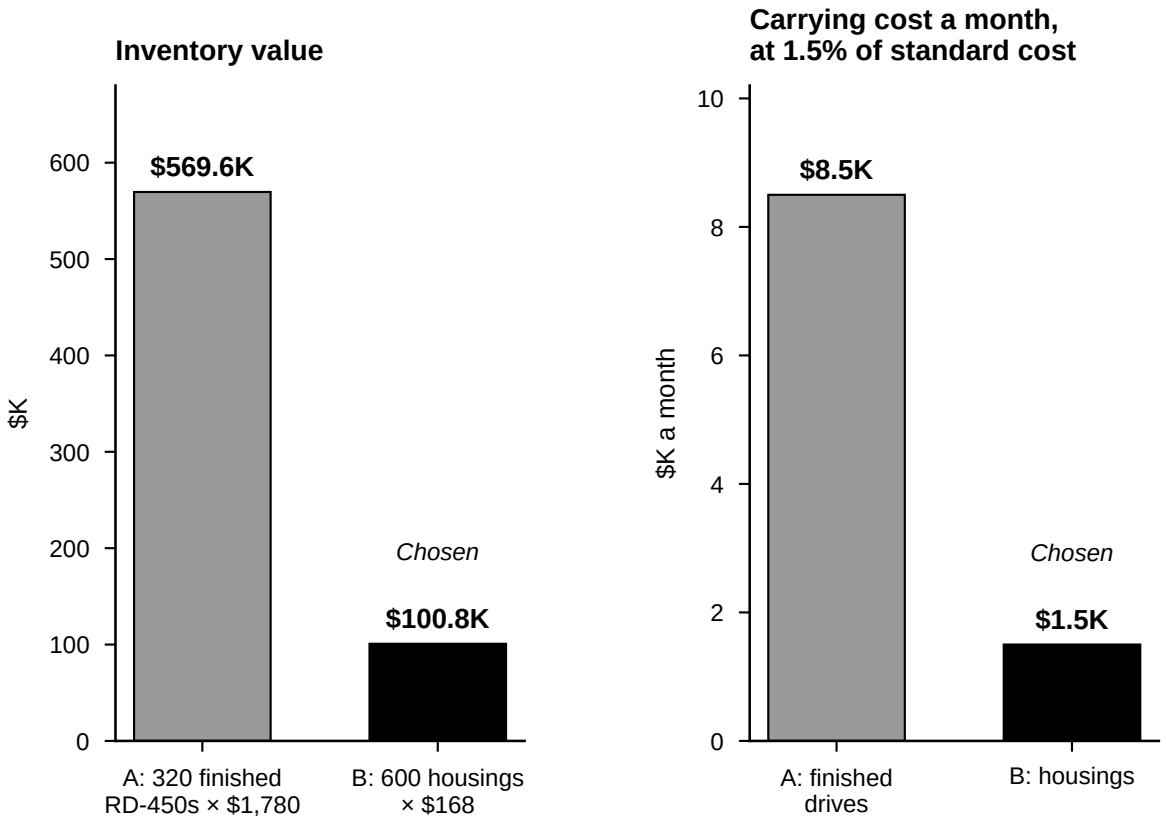


Safety stock = 1.65 × 7,125 × √1 (95% service, forecast error 7.5% of 95,000 a month, one-month replenishment). Cycle stock = half a month's demand, each roller SKU made once a month. No prebuild: Joplin is not constrained.

Roller finished goods at the end of February, by category: 92,000 on hand against a target of 65,256. The 26,744 above target were all RR-19s, $909K at standard.

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Figure 6.2

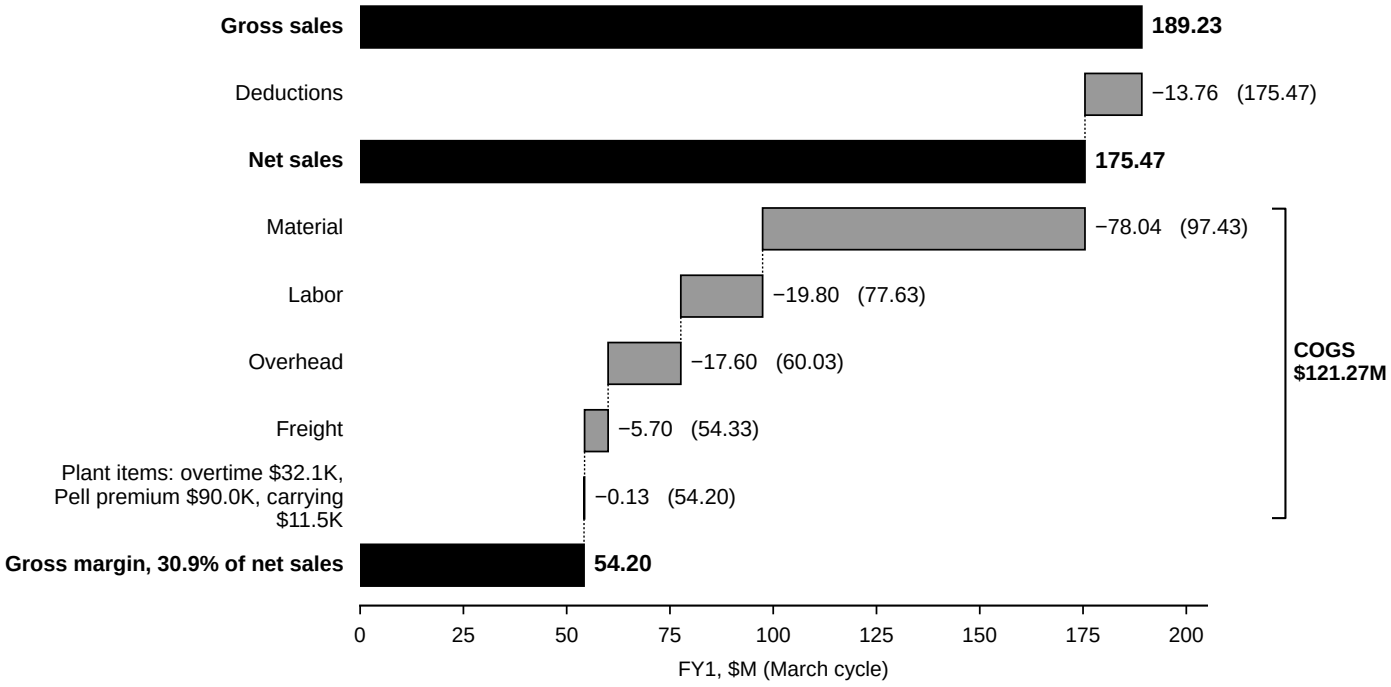


B was chosen at the March executive meeting. Owner: Teresa Amato. The uncertainty was the housing, not the drive.

Two ways to protect RD-450 service against Delmore Castings: 320 finished drives ($569.6K, $8.5K a month to carry) or 600 housings ($100.8K, $1.5K a month). Riverton held the housings.

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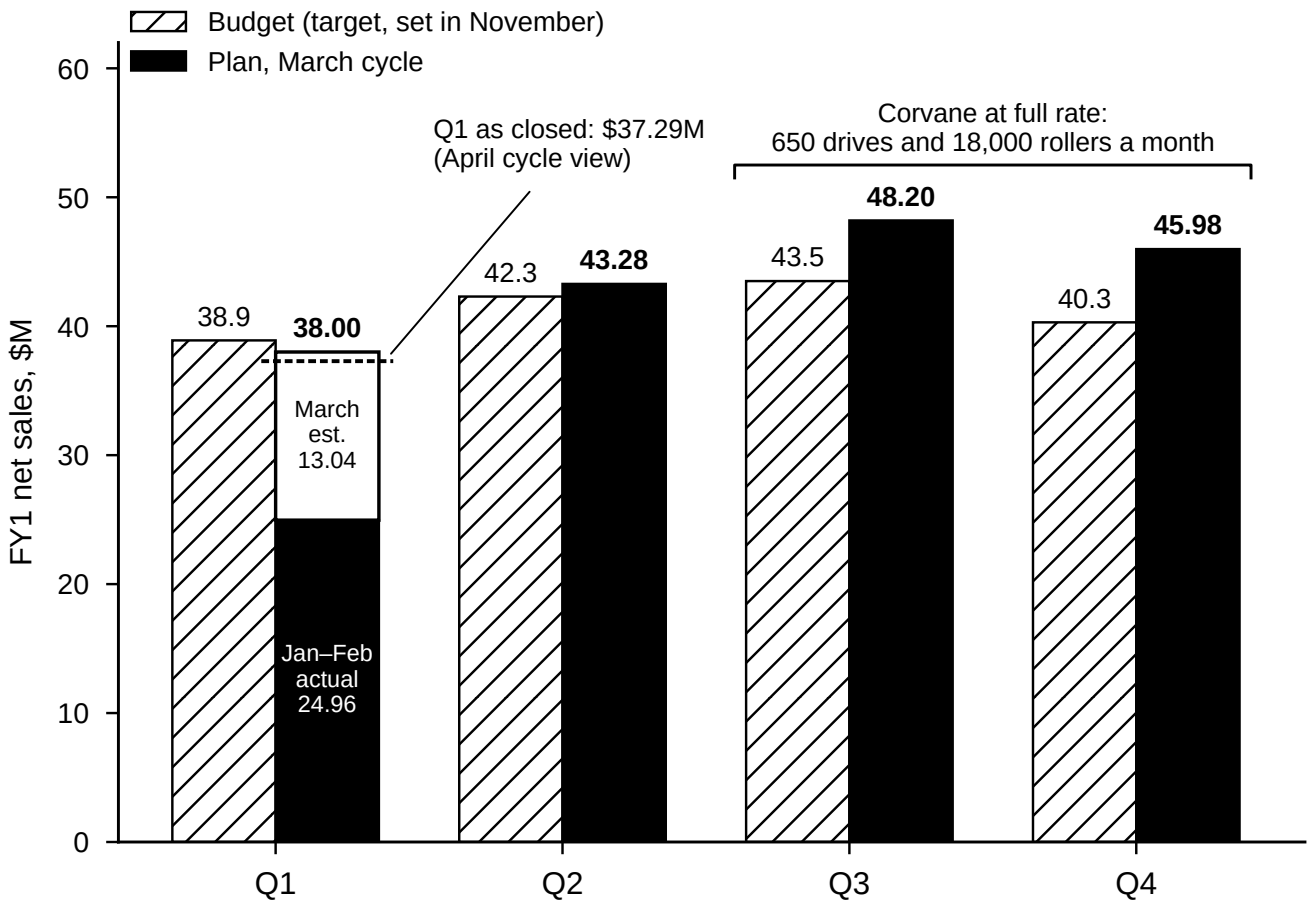
Figure 7.1



Riverton's planning P&L; for this year as the March cycle priced it, from $189.23 million of gross sales to $54.20 million of gross margin, 30.9 percent of net sales.

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Figure 7.2

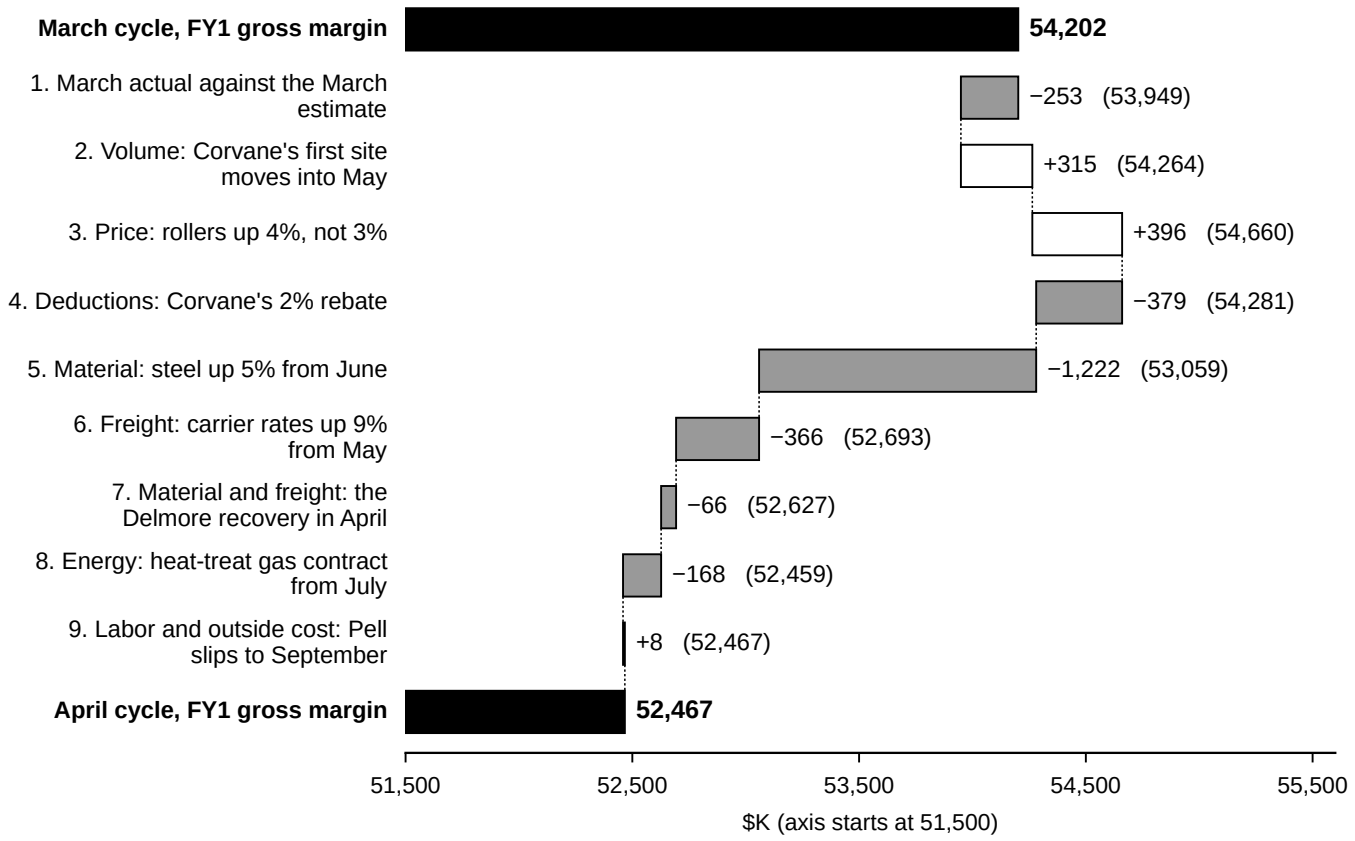


Year: budget $165.0M, plan $175.47M. Budget: no Corvane. Plan: Corvane from June.

Riverton's net sales this year by quarter, the Board's budget beside the March-cycle plan, with the first quarter that closed at $37.29 million marked against the plan's part-actual, part-estimated $38.00 million.

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Figure 8.1

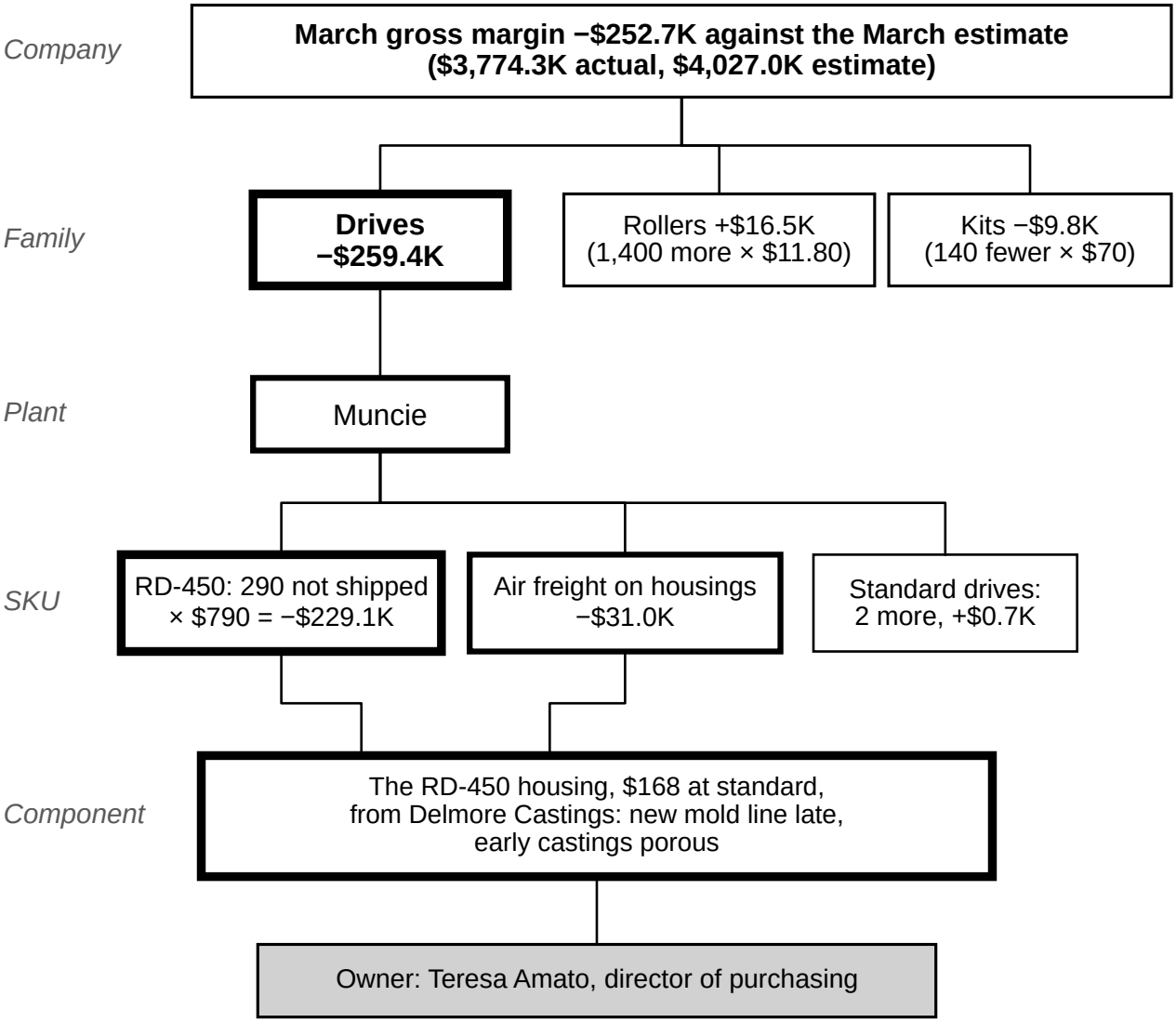


Net −1,735: three favorable steps +719, six unfavorable steps −2,454. Increases in white, decreases in grey.

The walk-forward from the March cycle to the April cycle — this year's planned gross margin, $54,202K to $52,467K, in nine steps taken in a fixed order, each labeled with its cause.

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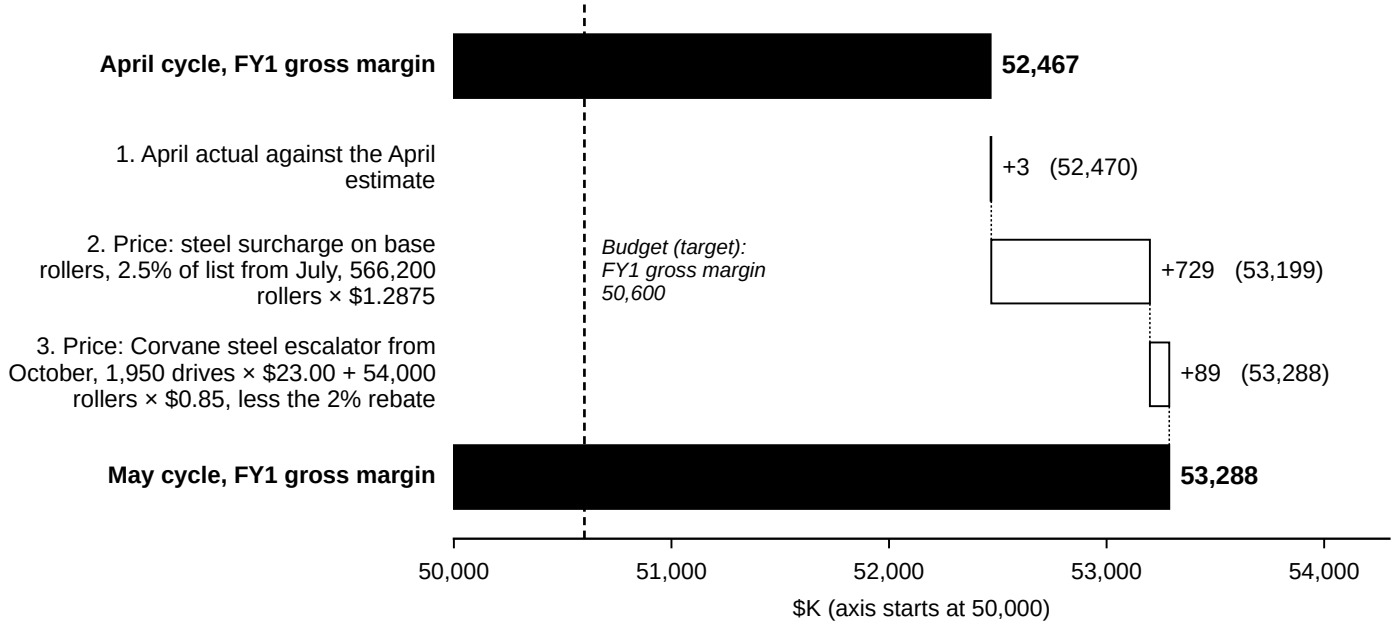
Figure 8.2



The drill on March's miss — company, family, plant, SKU, component — until a $252.7K shortfall becomes a $168 casting from Delmore Castings with an owner.

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Figure 9.1



Check: 52,467 + 821 = 53,288. The two steel decisions of May 21: +818.

The walk-forward from the April cycle to the May cycle, in whole thousands of dollars: this year's gross margin moves from $52,467K to $53,288K, $818K of it from the two steel decisions of May 21.

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Figure 9.2

Cycle	No.	Decision	Owner	Value or effect
March cycle · executive SIOP, March 24				
March	1	Approve the consensus demand: Corvane from June at 650 drives and 18,000 rollers a month, Q2 $43.28M	Dennis Sandoval	FY1 plan $175.47M net
March	2	Approve Option 3: Saturday overtime to 120 h, prebuild in April and May, Pell for RK-40 gear sets from August, overtime to 200 h only if needed. Third shift and overtime-only rejected	Curt Lanning	$196K over ten months ($133.6K in FY1)
March	3	Hold 600 Delmore housings as component safety stock instead of finished RD-450s	Teresa Amato	$100.8K of inventory instead of $569.6K
March	4	Confirm the roller price increase of 3% from May	Dennis Sandoval	In the plan
March	5	Stop RR-19 runs for eight weeks and sell down the excess	Sharon Keene	$909K of excess to zero by September
April cycle · executive SIOP, April 21				
April	6	Accept Corvane's May pull-in, prebuild 40 RD-450-class units in May	Curt Lanning	+$315K FY1 gross margin
April	7	Overtime at the gear cell to 144 h in August, two Sunday shifts included, after Pell's slip, hobbers' maintenance moved to a September Saturday	Wade Cutler	In the plan
April	8	Confirm the roller price at 4%, not 3%	Dennis Sandoval	+$396K
April	9	Commission recovery options for steel and freight for the May cycle, priced with Gavin Stroud, not decided in the room	Dennis Sandoval	No value
May cycle · executive SIOP, May 21				
May	10	Steel surcharge on base rollers, 2.5% of list from July, letters by May 31, Corvane's contract rollers excluded	Dennis Sandoval	+$729K FY1
May	11	Invoke Corvane's steel escalator from October, 5% of steel content, notice by June 30	Dennis Sandoval	+$89K FY1
May	12	Confirm Pell's September start, first-article retest June 12	Teresa Amato	No value

Decisions made and logged: March 5, April 4, May 3.

Riverton's decision log for its first three cycles: twelve decisions, five in March, four in April and three in May, each with its owner and its value or effect.

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Figure 10.1

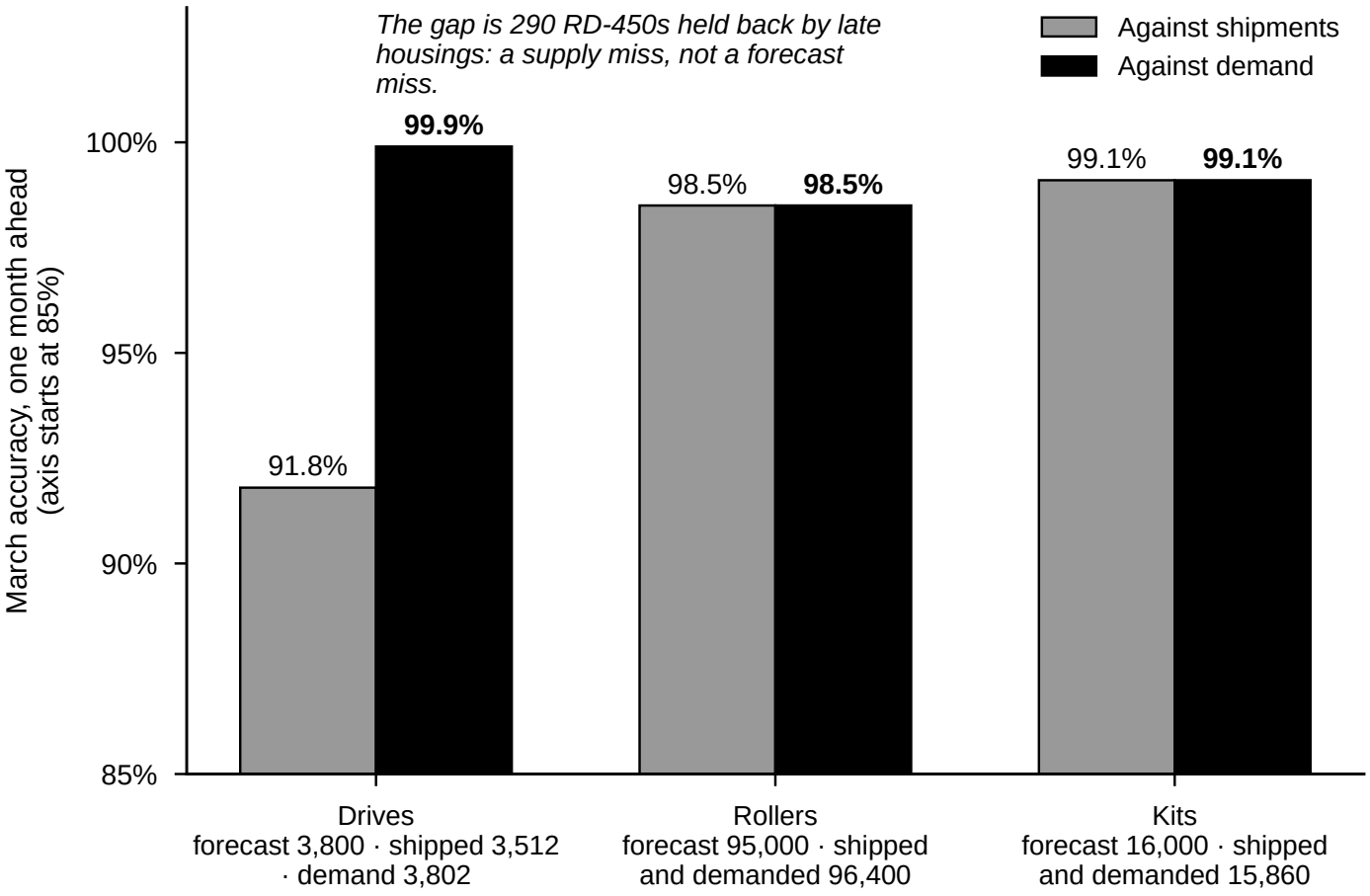
Measure	Target or band	March cycle (Feb data)	April cycle (Mar data)	May cycle (Apr data)
Business measures				
Net sales against the one-month-ahead plan	within ±3%	—	−5.5%	+0.1%
Gross margin against the one-month-ahead plan	within ±3%	—	−6.3%	+0.1%
On time in full (OTIF), all customers	95% (Corvane 98%)	92.4%	88.1%	93.6%
Days of inventory outstanding (DIO)	74 by December	78.5	79.1	79.8
Excess inventory at standard	zero by September	$909K	$909K	$652K
Gear-cell load (load ÷ 1,500 hours)	at or under 100% plus approved overtime	88.7%	86.7%	93.9%
Process measures				
Forecast accuracy, all families	95% or better	—	99.3%	99.0%
Forecast bias, all families	within ±2%	—	−0.4%	+0.0%
Schedule attainment, gear cell	97% or better	95%	92%	99%
Inventory record accuracy	98% or better	96.0%	96.4%	97.1%
Process-health measures				
Data published on time	day 3	day 6	day 3	day 3
Attendance with decision rights	100%	82%	94%	100%
Decisions made and logged	every one logged	5	4	3
Actions closed on time	90% or better	none due	7 of 9	8 of 8

Accuracy and bias measured against demand, family level, one month ahead, weighted by net sales. A dash means no earlier plan existed to measure against.

Riverton's SIOP scorecard after three cycles: six business measures, four process measures and four process-health measures, each with its band, read for the March, April and May cycles.

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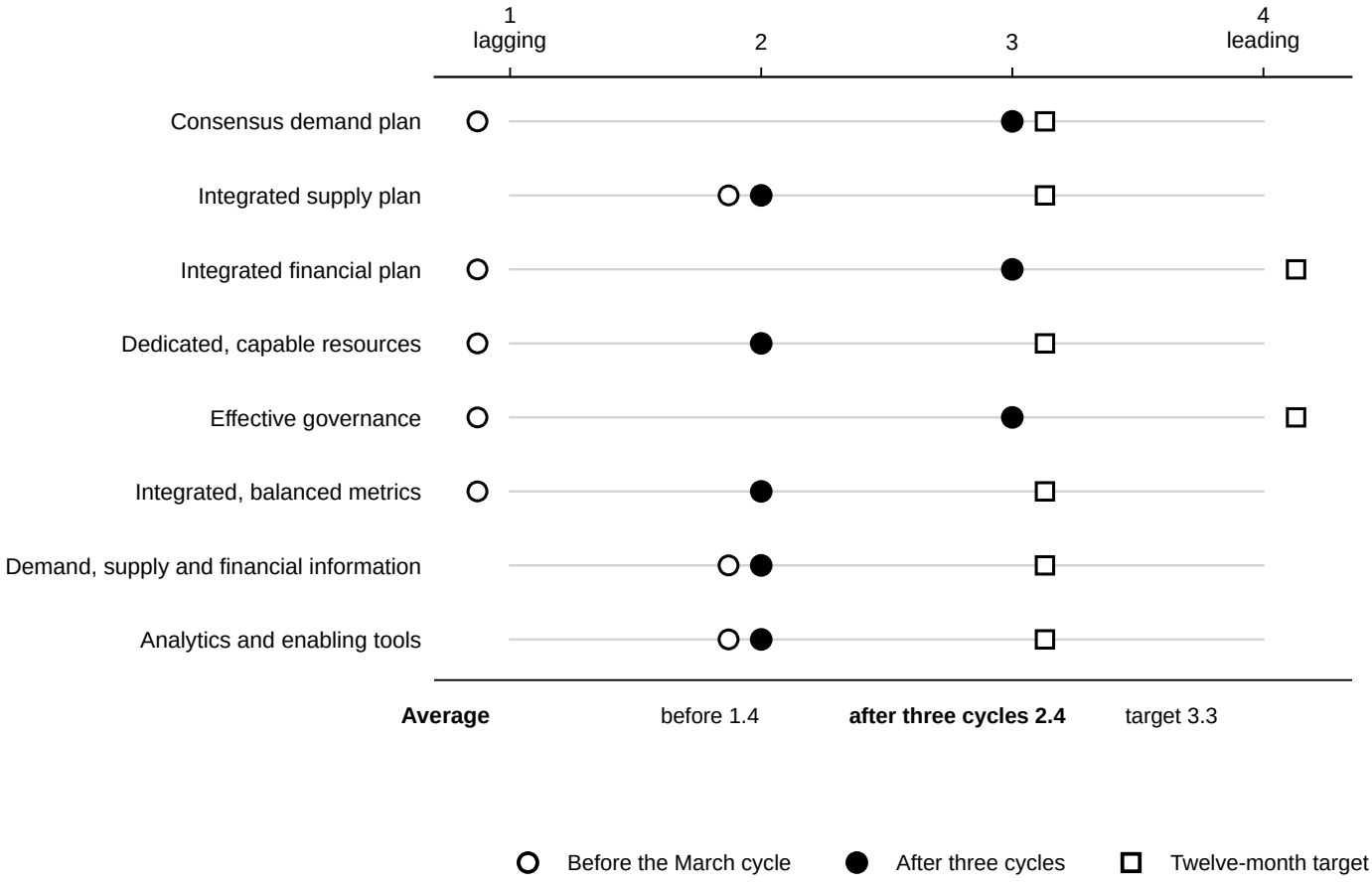
Figure 10.2



March forecast accuracy by family, against shipments and against demand. Only drives differ, by the 290 RD-450s that late housings kept from shipping.

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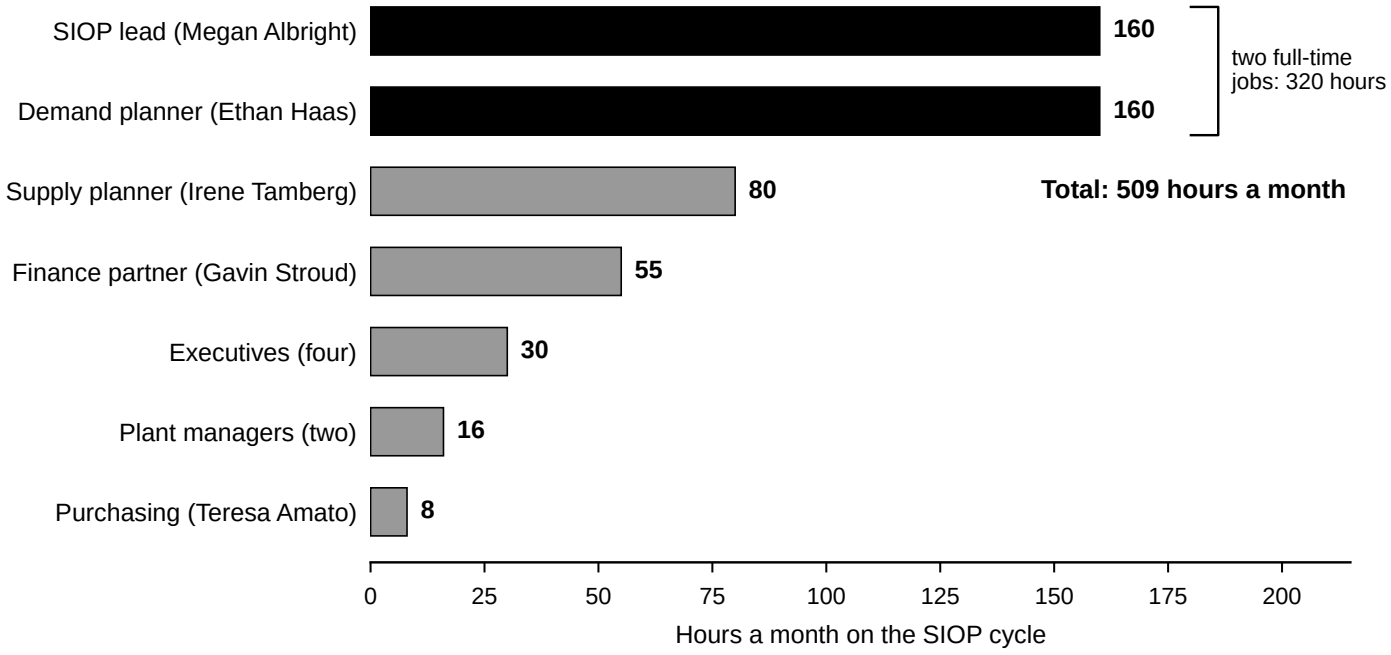
Figure 11.1



Riverton's maturity scorecard — eight areas on four levels, before the March cycle (average 1.4), after three cycles (2.4) and the twelve-month target (3.3).

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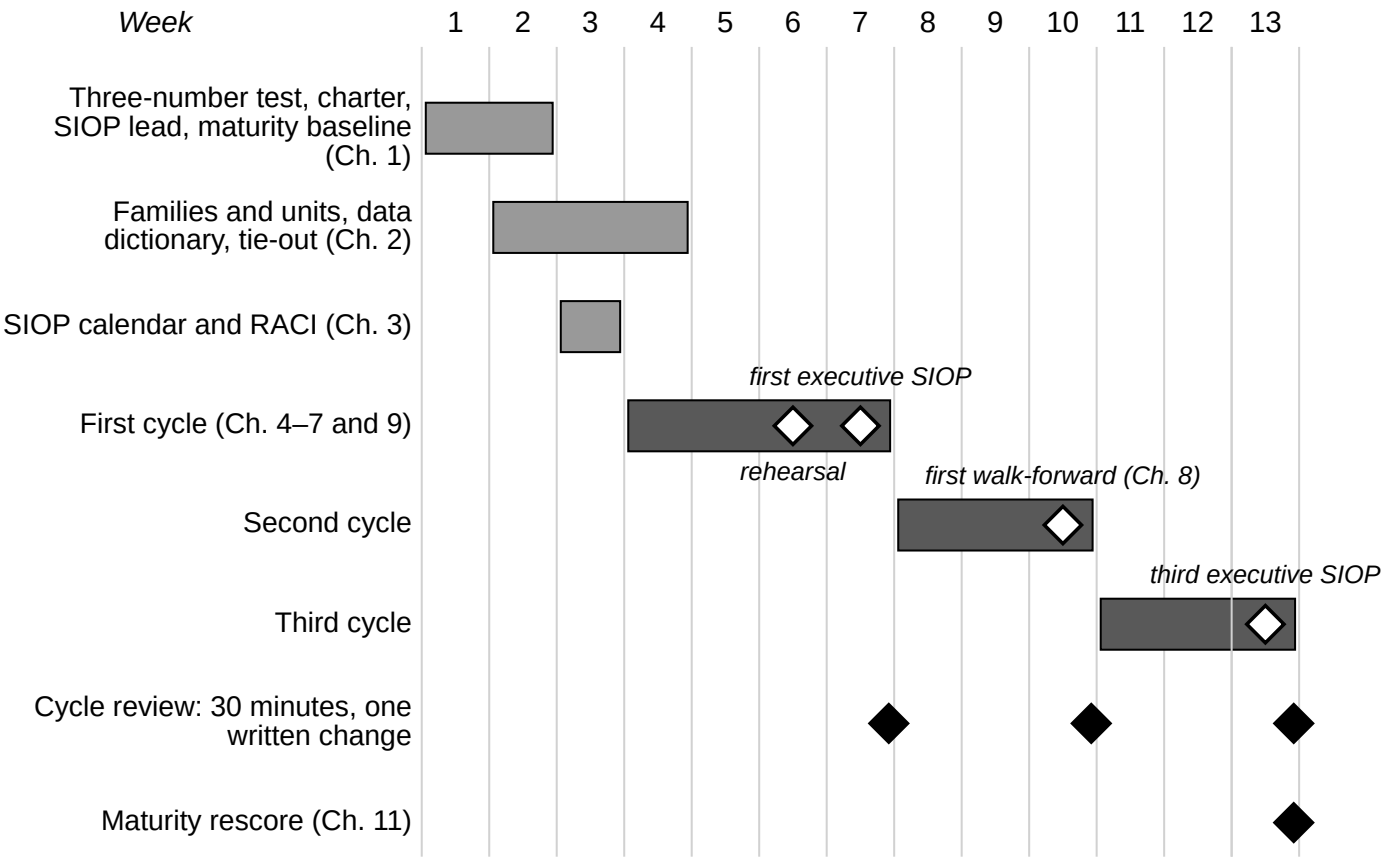
Figure 11.2



Who runs the cycle at Riverton after three cycles — 509 hours a month, 320 of them in two full-time jobs and 189 borrowed from people with other work.

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Figure 12.1



Riverton ran it from the February 20 business review to the May 21 executive SIOP.

The ninety-day rollout: thirteen weeks from the three-number test to the third cycle's review, with the rehearsal before the first executive SIOP and a cycle review closing each of the three cycles.

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Figure 12.2

	March cycle	April cycle	May cycle
Executive SIOP held	March 24	April 21	May 21
FY1 net sales in the plan	$175.47M	$175.93M	$176.76M
FY1 gross margin in the plan	$54.20M (30.9%)	$52.47M (29.8%)	$53.29M (30.1%)
Change in FY1 gross margin from the previous plan	none (first cycle)	−$1,735K	+$821K
Decisions made and logged	5	4	3
Data published	business day 6	business day 3	business day 3
Attendance with decision rights	82%	94%	100%

Budget (the Board's target) for FY1: $165.0M net sales, $50.6M gross margin.

Three cycles at Riverton: each plan's net sales and gross margin for this year, the change from the plan before, the decisions made and logged, the day the data was published and attendance with decision rights, against a budget of $165.0 million and $50.6 million.

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Put It to Work

Pages from The Field Guide

After three cycles, the week the May plan went out, I ran the test again. Dennis, Joan and Curt each gave me about $48.6 million for the third quarter, from the same page. You start where we did in February.

Take these pages into a room with your heads of sales, finance and operations and the person you'll name SIOP lead. Work from last month's shipments and the ledger, not the budget. Write down what you can show, and name who'll find the rest and by when.

Start with the three-number test, even if you're sure your leaders agree. So was I, more than a year into the job. Our spread was 13.9 percent, and the plants were building the smallest of the three by default.

Nerve Center · The Field Guide, sold separately, has all thirty-nine worksheets with Riverton's page filled in beside every blank, plus the Use the Tools page, Week Zero, the first ninety days, the SIOP month on one page for the wall, a running order for each step, a facilitator's guide and the five questions on one page. The Instruments page lists them by chapter.

What the first meeting must put on paper

1. Three numbers, the spread, the number the plants are building to and every decision waiting on another function's number.
2. A SIOP lead with the hours written down, and a one-page charter signed by everyone it names.
3. The maturity baseline, dated, and the first executive SIOP on the calendar, with you in the chair.

Do the work by hand or use the tools you have. Before the room acts on a tool's numbers, tie them to the ledger, and do the first one by hand. The person who owns a number makes the call.

Thinking is required.

SIOP on one page

The numbers are the chapters. You do Part One once, before the first cycle. Part Two runs every month, five steps in fifteen business days. Part Three makes the cycle last.

Part One · One Plan

1. **Give the Business One Plan.** The three-number test, the charter, a SIOP lead who owns no number and the maturity baseline.
2. **Agree on the Numbers.** Planning families and their units, the data dictionary and the tie-out, frozen on business day 3.
3. **Set the Calendar and Name the Owners.** Dates in business days, one A per row of the RACI and the rules of the room.

Part Two · The Cycle

4. **Build the Demand View.** Three layers, the assumption log and three named cases, approved unconstrained by day 6.
5. **Test What Supply Can Deliver.** The capacity check at the constraint, the lever menu and a gap sheet per gap, by day 9.
6. **Make the Inventory and Service Tradeoffs.** The inventory map, safety stock, the service promise and the tradeoff sheet.
7. **Translate Units into Dollars.** The planning P&L to gross margin, gross-to-net and the plan against the target.
8. **Explain What Changed.** The walk-forward in a fixed order, the drill and the three causes, from the second cycle.
9. **Run the Decision Cycle.** The pre-SIOP by day 12, the executive SIOP by day 15 and the decision log.

Part Three · Make It Last

10. **Measure and Improve the Process.** Fewer than twenty measures, each banded and owned, and the three-cause sheet.
11. **Raise the Process a Level.** The maturity rescore, owners for the data, and software only after six cycles on time.
12. **Put the First Three Cycles to Work.** The ninety-day rollout, the rehearsal, the planning pack and the cycle review.

The first thirty days

This month, you charter one plan, tie last month to the ledger and open the first cycle on its date, ready or not.

Days 1 to 7: measure the distance and charter the plan. Ask your heads of sales, finance and operations for next quarter's net sales, each alone, on the same day, and work out the spread. List every decision that's waiting on another function's number. Tell the three together what you've decided. Then name the SIOP lead, sign the charter and score the eight maturity areas in the same sitting.

Done / still open: _____

Owner / due by: _____

Days 8 to 21: agree the numbers and fix the dates. Draw the planning families, one unit of measure each. Write the data dictionary, one owner to a field, and have the chief financial officer sign it. Put twelve months of SIOP dates on the calendar, and write the RACI with one A per row, initialed. Start the tie-out of last month's dataset.

Done / still open: _____

Owner / due by: _____

Days 22 to 30: open the first cycle on its date. Freeze the dataset on business day 3 and publish it with its tie-out, every open line with a name and a date. The demand planner draws the baseline from thirty-six months of shipments and opens the assumption log. The supply planner names the constraint and its hours a month. Sign the decision rights, and book the pre-SIOP, the rehearsal and the executive SIOP.

Done / still open: _____

Owner / due by: _____

On Day 30, meet again. Put the spread, the signed charter, the baseline, the dictionary, the tie-out, the year's dates and the RACI on the table. At Riverton, we heard our three numbers on February 20 and signed our charter on February 27, with a baseline of 1.4. Our first dataset came out on March 9, three days late, with $9.8K open under Gavin Stroud's name. Every date we set from there held, and I'd hold yours the same way.

First executive SIOP, date and chair: _____

A. The three-number test and the charter

Ask your heads of sales, finance and operations for next quarter's net sales, one at a time on the same day, and write each number down in front of its owner. Then the charter puts the plan's owner, lead and members on one page.

Whose number	Next quarter	What it assumes
Sales		
Finance		
Operations		
The plants' schedule		

Spread, (highest − lowest) ÷ middle: _____

The charter	Your answer
Executive owner	
SIOP lead, and the share of the week	
Members, by seat	
The four decisions, word for word	
Scope: families, plants, horizon	
The calendar, by business day	
What the cycle will not do	

Our three numbers went up on February 20: $46.0 million from Dennis Sandoval in sales, $42.3 million from Joan Hadley in finance and $40.1 million from Curt Lanning in operations, a spread of 13.9 percent ($5.9 million over the middle number). The plants were building Curt's, last year's $39.1 million plus two and a half percent, with no Corvane and no price increase. On February 27 we signed the charter: me as executive owner, Megan Albright as full-time SIOP lead and nine members by seat.

Past five percent, you're running more than one company. Past ten, the plants have already picked one of the numbers, and you need to find out which.

Full Field Guide: Worksheets 1 and 2.

B. The tie-out

The tie-out walks last month's planning dataset to the ledger's net sales, one named line at a time. The finance partner builds and signs it, the chief financial officer reads it, and it goes out with the dataset on business day 3.

Net sales as the plan defines it, and the month: _____

Family	Units shipped	Standard net price	Dollars

Planning dataset

Kind	Cause	Amount	Running total	Owner
Price				
Timing				
Returns				
Classification				
Deductions				
Unexplained				

Gavin Stroud started from February's 3,601 drives at $1,600, 91,200 rollers at $48.00 and 16,520 kits at $150.00, a dataset of $12,617.2K, against the ledger's $12,442.8K. Off-invoice discounts on forty-one orders took $61.4K, goods shipped on February 27 and 28 but billed in March $118.3K, and a returned lot of RR-25 rollers $22.6K. Freight billed to customers put $84.9K back, and a rebate accrual missing from the price file took $47.2K. The last $9.8K went out open on March 9, with Gavin's name on it.

Publish on business day 3, open lines and all. A gap with a name beside it gets closed, as Gavin's was before the April cycle.

Full Field Guide: Worksheets 5 and 6.

C. Next quarter in three layers

Next quarter's demand, history first, then the changes a stranger could check, then the judgment calls, each signed. The demand planner builds it family by family, the finance partner prices it, and the head of sales approves one unconstrained number by business day 6.

Family, and the months of shipments drawn on: _____

Layer	Line	Evidence	Owner	Dollars
1. Baseline				
2. Known change				
2. Known change				
3. Assumption				
Consensus				

Assumption	Owner	Evidence	Confidence	Trigger

Ethan Haas built Riverton's second quarter for the March 11 review. The baseline from thirty-six months of shipments came to $40.43 million. Corvane's June added 650 drives at $2,640 and 18,000 rollers at $46.00, $2.54 million, and the roller price, up three percent from May, $0.31 million, in dollars only. Layer three put Corvane in June rather than May, after forty minutes and one call to Corvane. The consensus was $43.28 million. The log's first line, Corvane starts in June, carried Dennis Sandoval's name, medium confidence and one trigger, the site-readiness report. It fired on April 6.

Leave the view unconstrained. A forecast cut down to what the plant can build hides the gap until a customer finds it on the dock.

Full Field Guide: Worksheets 11 and 12.

D. The capacity check and the gap sheet

Demand in units turned into hours at the one resource the work waits for, month by month, with each gap left where the arithmetic puts it. The supply planner builds it, and the owner of the supply plan takes each gap forward on one page, priced.

The constraint, its owner and its hours a month: _____

Month	Units	Load, hours	Capacity	Gap

Option	What it does	Cost	Risk	Lead time

Recommendation, owner and decide-by date: _____

Irene Tamberg worked Riverton's June by hand: 1,026 hours for 4,104 base drives at a quarter hour, 325 for Corvane's 650 at half an hour and 329 for 940 RK-40 gear sets at 0.35. That's 1,680 hours against the gear cell's 1,500, and the cell ran short for ten months, 1,325.8 hours in all. Curt Lanning's sheet priced four options. Overtime alone cost $126K and gave up the Sunday maintenance window in five months. A third shift cost $643K and wouldn't arrive until September. Corvane said no to phasing. On March 24 we bought Saturdays, a prebuild and Pell's gear sets for $196K over ten months.

Every gap sheet carries a decide-by date. It's the day the best option disappears, and a sheet without one goes back to its owner.

Full Field Guide: Worksheets 14 and 17.

E. The decision log

The log gets one line for every decision the executive SIOP makes, written in the meeting and read back before anyone stands. The SIOP lead keeps it and brings every status up to date before the next pre-SIOP.

What the pre-SIOP may approve on its own: _____

Date	Decision	Owner	Due	Value	Status

This year's gross margin the log has added so far: _____

I signed Riverton's decision rights before the first pre-SIOP. They let the pre-SIOP approve up to 120 hours of overtime a month and prebuilds under $250K, and sent up anything that moved this year's gross margin by more than $250K. We logged twelve decisions in three cycles, five in March, four in April and three in May. Four of them added $1,529K to this year's gross margin: the May pull-in, the roller price at four percent, the steel surcharge and Corvane's escalator. Line 9 was a decision not to decide, owned by Dennis Sandoval and due back at the May cycle.

Write every line so its owner can act on it the next morning. A line that reads "discussed" or "noted" goes back to the pre-SIOP.

Full Field Guide: Worksheets 28 and 31.

Reference table: How to Read This Book

When	Read	Produce
The week you decide	How to Read, 1	The spread from the three-number test, the SIOP lead named, the charter on one page, the maturity baseline, the first executive SIOP on the calendar
Weeks 1–3	2, 3	Planning families and units of measure, the data dictionary, the first tie-out, twelve months of SIOP dates, the RACI (responsible, accountable, consulted, informed) with one A per row
The first cycle, weeks 4–7	4, 5, 6, 7, 9	The demand view and its assumption log, the capacity check and gap sheets, the inventory map and the service promise, the planning P&L, the first decision log
The second cycle, weeks 8–10	8	The first walk-forward, the drill, one of three causes named for every variance
The third cycle, weeks 11–13, and after	10, 11, 12	The SIOP scorecard, the three-cause sheet, the maturity scorecard rescored, the cycle review

Reference table: Chapter 5: Test What Supply Can Deliver

Option	What it does	Cost	Risk	Verdict
1. Overtime only	Every hour of the gap on overtime, 1,325.8 hours at $95	$126K	Sundays in five months, June through September back to back, with no maintenance window on the hobbers	Rejected
2. Third shift from September	600 hours a month for $85,000 a month fixed, nine operators, five months to hire and train	$643K: seven months of shift ($595K) and 504 hours of summer overtime ($48K)	Arrives after the summer peak it was meant for, and its cost runs on after the gap closes	Rejected
3. Saturdays, prebuild, Pell	Overtime to 120 hours, 216 RD-450-class units built ahead in April and May, Pell from August, overtime to 200 only if needed	$196K over ten months: overtime $40K, Pell $144K, carrying $11.5K ($133.6K of it this year)	Pell's first article has to pass	Approved
4. Ask Corvane to phase	Half of Corvane's drives in June and July moved later	$1.72M of revenue and $514K of gross margin deferred	A new customer's patience	Corvane said no

Reference table: Chapter 8: Explain What Changed

Step	What moved	$K	Running total
Start	The March cycle's gross margin for the year		54,202
1	March actual against the March estimate	−253	53,949
2	Volume: Corvane's first site moves into May	+315	54,264
3	Price: rollers up four percent, not three	+396	54,660
4	Deductions: Corvane's two percent rebate	−379	54,281
5	Material: steel up five percent from June	−1,222	53,059
6	Freight: carrier rates up nine percent from May	−366	52,693
7	Material and freight: the Delmore recovery in April	−66	52,627
8	Energy: the heat-treat gas contract from July	−168	52,459
9	Labor and outside cost: Pell slips to September	+8	52,467
End	The April cycle's gross margin for the year	−1,735	52,467

Reference table: The Instruments

Chapter	Instruments	Worksheets
1. Give the Business One Plan	The three-number test · the SIOP charter · the maturity scorecard, baseline	1, 2, 3
2. Agree on the Numbers	Planning families and units of measure · the data dictionary · the tie-out	4, 5, 6
3. Set the Calendar and Name the Owners	The SIOP calendar · the RACI · roles, hours and the rules of the room	7, 8, 9
4. Build the Demand View	Forecast, target and commitment · the three layers · the assumption log · base, upside and downside	10, 11, 12, 13
5. Test What Supply Can Deliver	The capacity check · gross margin per constraint hour · the lever menu · the gap sheet	14, 15, 16, 17
6. Make the Inventory and Service Tradeoffs	The inventory map · safety stock · the service promise · the tradeoff sheet	18, 19, 20, 21
7. Translate Units into Dollars	The planning P&L · gross-to-net · the plan against the target	22, 23, 24
8. Explain What Changed	The walk-forward · the drill · price and quantity variance	25, 26, 27
9. Run the Decision Cycle	Decision rights · the pre-SIOP and the planning pack · the exception agenda · the decision log	28, 29, 30, 31
10. Measure and Improve the Process	The SIOP scorecard · process health · the three-cause sheet	32, 33, 34
11. Raise the Process a Level	The maturity scorecard, rescore and target · data owners and the data-issue log	35, 36
12. Put the First Three Cycles to Work	The ninety-day rollout · the rehearsal · the cycle review	37, 38, 39

Reference table: Continue the Work

If this is you	Read
The first cycle starts next month	Nerve Center · The Field Guide, then Chapter 12 again at day ninety
Next year's budget has to come from the plan	The Strategy Management Process
The plan is set, and the monthly rhythm to deliver it is not	The Strategy Deployment Process
The walk-forward keeps finding price	Get Paid
The supply review keeps finding cost	Cost Is a Choice
You need the whole 80/20 program, not just the plan	The 80/20 Company
SIOP needs a place in the CEO's operating rhythm	FORGE
Nobody on your team holds the others to the calendar	The Rule of Three
You want to see where the method underneath it came from	The 80/20 CEO
Your team would take a story before a manual	The Art of Making Honey

Glossary

The terms this book uses, defined as it uses them. Where a term has a home chapter, that chapter is named.

Added shift. A lever on the lever menu: another shift at the constraint. At Riverton a third shift at the gear cell would have added 600 hours a month for $85,000 a month of fixed cost and nine operators, and taken five months to hire and train. Its cost runs whether the hours are used or not. Chapter 5.

Assumption log. The list of judgment calls behind the demand view, one line each, with an owner, the evidence, a confidence (high, medium or low) and a trigger. An assumption that couldn't move a family by more than the review's tolerance doesn't need a line. Chapter 4.

Assumptions. The third of the three layers: the judgment calls in the demand view, named and signed. When a new customer will start, how fast a market will grow, whether a program has ended. Chapter 4.

Base, upside and downside. Three cases for the plan, each named for its cause, never for a percentage. At Riverton the upside was a fourth Corvane site from October and the downside was Corvane slipping to September with the base business five percent lower from July. Chapters 4 and 7.

Bias. The forecast's lean: forecast minus actual, divided by actual, at the family level, one month ahead, weighted by net sales. Its sign tells you more than its size. Read the families before the total, because two misses in opposite directions can add up to zero. Chapters 4 and 10.

Budget. The target the Board approved for the year. At Riverton, $165.0 million of net sales and $50.6 million of gross margin, set in November. The plan is held against it every month and never rewritten to match it. Chapters 4 and 7.

Business day. A working day counted from the start of the month. The SIOP calendar is written in business days, so the same step falls on the same count every month whatever the date. Chapter 3.

Business measures. The six rows of the SIOP scorecard that say what last month's plan delivered: net sales and gross margin against the one-month-ahead plan, OTIF, DIO, excess inventory and load at the constraint. Chapter 10.

Capacity. What the constraint can produce in a month at the pace it can sustain, in the same hours as the load. Overtime isn't capacity. It's a lever, with a price. Chapter 5.

Capacity check. Load against capacity at the constraint, by family and by month, for eighteen months, with the gap in every month that runs over. Planners call it rough-cut capacity planning. Chapter 5.

Carrying cost. What it costs to hold a unit of inventory for a month — money tied up, space, handling and the risk of obsolescence. Riverton used 1.5 percent of standard cost a month. Chapters 5 and 6.

Charter. See *SIOP charter*.

COGS (cost of goods sold). In the planning P&L, material, labor, overhead and freight at standard, plus plant items. Chapter 7.

Commitment. The plan the executive meeting approves and the company builds to. It comes out of the cycle, not into it, and it's the number a leadership team should be held to. Chapter 4.

Constraint. The one resource that sets the pace for the whole company. At Riverton, the gear cell at Muncie. Chapter 5.

Corvane. The warehouse-automation integrator that became Riverton's largest new customer, building three distribution centers. Invented. Chapters 1, 4, 5 and 7.

CRM (customer relationship management system). The system that holds open quotes and customers' forecasts. Chapter 2.

Cutoff. The moment a number stops moving for this cycle. Riverton's cutoff for shipments is midnight on the last business day of the month. Chapter 2.

Cycle, the. The monthly SIOP process: five steps, from the data step to the executive SIOP, inside the first fifteen business days of the month. How to Read This Book and Chapter 3.

Cycle review. Thirty minutes on the day the plan is published, chaired by the SIOP lead, that asks three questions in order — what do we keep, what is the one thing we change, what do we stop — and writes one change on one page. The only place a tolerance band gets moved. Chapter 12.

Cycle stock. The inventory that covers a run size. A SKU made once a month averages half a month's supply. Chapter 6.

Data dictionary. Every field the cycle uses, written down once: its definition, its source of record, its cutoff and one owner. Conversions from a customer's units into yours are written there, too. Chapter 2.

Data freeze. The point at which the month's dataset stops changing. At Riverton, business day 3. Chapters 2 and 3.

Data-issue log. The list of every problem found in the cycle's data: when it was found and by whom, the field and its source of record, what's wrong and what it does to the plan, the owner, the fix, the date due and the date closed. Read by the data sponsor once a month, before the pre-SIOP. Chapter 11.

Data owner. The person who reads a source of record every month and suffers first when it's wrong — at Riverton, Gavin Stroud for finance, Irene Tamberg for supply and Ethan Haas for demand. A data owner chases the dictionary's field owners until a problem is fixed. Chapter 11.

Data step. The first step of the cycle, business days 1 to 3: the month's actuals pulled, frozen, tied to the ledger and published. Chapters 2 and 3.

Decision log. The register of every decision the executive meeting makes, one line each: the date, the decision in one sentence its owner can act on, the owner, the due date, the value in dollars and the status. A decision not to decide gets a line as well. Riverton logged twelve in its first three cycles. Chapter 9.

Decision rights. What the pre-SIOP may decide on its own and what goes up to the executive meeting, with a dollar line between them, written on half a page before the first pre-SIOP. Chapter 9.

Deductions. Everything that comes off list price before it becomes net sales: discounts, allowances, rebates and contract terms. Chapter 7.

Delmore Castings. The foundry that casts the housing for every RD-450. Its new mold line ran late in March. Invented. Chapters 5, 6 and 8.

Demand planner. The person who builds the demand view each month — the baseline, the known changes and the assumption log. At Riverton, Ethan Haas, full time. Chapters 3 and 4.

Demand review. The second step of the cycle, by business day 6, where the demand planner brings eighteen months of unconstrained demand and the head of sales approves one number. Chapters 3 and 4.

Demand shaping. A lever on the lever menu: asking a customer to move or phase its orders. Its cost is the margin deferred and the goodwill

spent asking, its limit is the customer's answer, and its lead time is a phone call. Chapter 5.

DIO (days of inventory outstanding). Inventory at standard cost divided by planned cost of goods per day. The counterweight to the service promise. Riverton's ran 78.5 days at the end of February against a target of 74 by December. Chapters 6 and 10.

Drill, the. Following a large step of the walk-forward down through the company, the family, the plant, the SKU and the component until it reaches something a person can fix. Riverton's March miss ended at one casting. Chapter 8.

Eighteen-month horizon. How far the plan runs. Long enough to see past the slowest lever — a shift hired and trained, a second supplier qualified, a price letter with its notice period. How to Read This Book and Chapter 1.

ERP (enterprise resource planning system). The system that records shipments, orders, inventory and standard costs. The source of record for most of the cycle's data. Chapter 2.

Exception agenda. The executive SIOP's five items in a fixed order: decisions requested, the walk-forward, the plan against target with base, upside and downside, the scorecard's exceptions and the read-back of the decisions recorded. No status reports and no new data. Chapter 9.

Exception-based review. A review that discusses only what moved. In Riverton's demand review, any family or SKU line that moved more than five percent against the last cycle in any month, or had new news behind it, came up. Everything else was approved by not being discussed. Chapter 4.

Excess. Inventory above every other category's target. It has no reason, and its cost is paid every month. Riverton's was 26,744 RR-19 rollers, $909.3K, left from a distributor program that ended in December. Chapter 6.

Executive owner. The person who owns the plan and breaks ties between the functions. It has to be the CEO or general manager, because whoever breaks the tie needs to outrank everyone in the argument. Chapter 1.

Executive SIOP. The fifth step of the cycle, by business day 15: the leadership team, with the CEO in the chair, makes the decisions the pre-SIOP framed and writes each one in the decision log. Chapters 3 and 9.

Finance partner. The person who prices the plan: the tie-out, the planning P&L and the walk-forward. At Riverton, Gavin Stroud, on about a third of his time. Chapters 2, 3, 7 and 8.

First article. The first part off a new supplier's process, inspected before production is approved. Pell Gear Works' failed in April and moved its start from August to September. Chapters 5 and 9.

Five steps, the. The data step, the demand review, the supply review, the pre-SIOP and the executive SIOP, due by business days 3, 6, 9, 12 and 15. The plan is published on day 16. Chapter 3.

Forecast. What the evidence says customers will buy, unconstrained. Not what you'd like them to buy, and not what the plants can make. Chapter 4.

Forecast accuracy. One minus the absolute error divided by actual demand, at the family level, one month ahead, weighted by net sales. Measured against demand, never against shipments. Chapters 4 and 10.

Four decisions, the. What the executive meeting exists to do: approve the demand plan, approve the supply plan and its costs, approve the financial plan and the gaps to target, and decide what the levels below could not. Chapters 1 and 9.

FY0, FY1, FY2. Last year, this year and next year in Riverton's figures and tables. The prose says last year, this year and next year.

Gap, the. Load less capacity at the constraint, month by month. Riverton's ran 1,325.8 hours from June of this year through March of next. Chapter 5.

Gap sheet. One page per gap: the issue, the timing, the size, the options from the lever menu with their costs, risks and lead times, a recommendation, one owner and the date after which the best option is gone. Chapter 5.

Gear cell. Riverton's constraint: the hobbing machines and heat-treat line at Muncie, 1,500 machine hours a month on two shifts, five days a week. Every drive passes through it, and so do the gear sets in RK-40 kits. How to Read This Book and Chapter 5.

Gross margin. Net sales less the cost of goods sold, plant items included. The line the plan is carried down to, and no farther. Chapter 7.

Gross margin per constraint hour. A product's gross margin divided by the hours it takes at the constraint. At Riverton, $2,180 an hour for a standard drive, $1,580 for an RD-450 and $586 for an RK-40 gear set. The ranking that tells you which work to protect when the hours run short. Chapter 5.

Gross sales. Units times list price. Chapter 7.

Gross-to-net. The distance from list price to net, step by step: every discount, allowance, rebate and contract term, by family, and by customer where a contract says something different. Chapter 7.

In transit. Stock already on its way to the place it will be sold. Chapter 6.

Inventory map. Every unit of finished goods sorted into five categories — safety stock, cycle stock, prebuild, in transit and excess — each with its own reason and its own target. Chapter 6.

Known changes. The second of the three layers: anything that will move demand for a reason the history cannot see, each with evidence a stranger could check and an owner. A company's own decisions count. Chapter 4.

Lever menu. Every way to close a gap at the constraint, each with its cost, its limit and its lead time written beside it: overtime, prebuild, outsourcing, an added shift and demand shaping. Chapter 5.

Load. Units in the plan times the hours each takes at the constraint, added up month by month. Chapter 5.

Maturity scorecard. Eight areas scored from 1 (lagging) to 4 (leading), one whole level each, with checkable evidence beside every score: consensus demand plan, integrated supply plan, integrated financial plan, dedicated and capable resources, effective governance, integrated and balanced metrics, demand, supply and financial information, and analytics and enabling tools. Scored before the first cycle, rescored after the third and every quarter after that. Riverton went from 1.4 to 2.4 and set 3.3 as its target a year out. Chapters 1 and 11.

Mix. The split of a family's units among its products. A family total can hold steady while its mix moves, and the hours at the constraint move with the mix. Every hundred Riverton drives that shift into the RD-450 class add about 33 hours at the gear cell. Chapters 5 and 12.

Net sales. Gross sales less deductions. In the cycle, units shipped times standard net price, tied to the ledger every month. Chapters 2 and 7.

Ninety-day rollout. The thirteen weeks from the three-number test to the third cycle's review, in a fixed order: the test, the charter and the baseline, then the families, the dictionary and the tie-out, then the calendar and the RACI, then three cycles, each closed by a cycle review. Chapter 12.

One A per row. The rule of the RACI: every row has one person accountable. Two A's on a row means nobody is. Chapter 3.

One number. A single plan for the quarter and the year that sales, finance and operations all work from, made in one room and published once a month. Chapter 1.

OTIF (on time in full). Order lines shipped complete by the promised date, divided by order lines due. Chapters 6 and 10.

Outsourcing. A lever on the lever menu: buying work the constraint would otherwise do. Riverton's was Pell Gear Works, 300 RK-40 gear sets a month at $60 a set over its own cost. Chapter 5.

Overtime. A lever on the lever menu: more hours at the constraint, at a price. Riverton's gear cell could run Saturdays for up to 120 more hours a month at $95 an hour, and Sundays to take it to 200, at the price of its only maintenance window. Chapter 5.

Pell Gear Works. The outside gear shop Riverton qualified as a second source for RK-40 gear sets. Invented. Chapters 5, 8 and 9.

Planning family. A group of products that share a market, a process and a unit of measure, so that their demand moves together and their capacity comes from the same place. Riverton plans in three: Drives, Rollers and Kits. Chapter 2.

Planning pack. The executive meeting's pages, ten at most, the same pages in the same order every month: decisions requested, the walk-forward, the plan against target, demand by family, capacity at the constraint, inventory and service, the scorecard's exceptions and the decision log. Chapters 9 and 12.

Planning P&L. The plan with a price on every line, built up from its units to the gross margin line, by family and by month, for eighteen months. Chapter 7.

Plant items. What the plan's own decisions cost, carried on their own line above gross margin: overtime, outsourcing premiums, energy, spot buys and the cost of carrying a prebuild. Riverton's March plan carried $133.6K of them for the year. Chapter 7.

Pre-SIOP. The fourth step of the cycle, by business day 12, chaired by the SIOP lead: units and dollars reconciled, every gap inside its decision rights closed, everything else framed as a decision with options, costs, a recommendation and an owner, and the planning pack built. Chapters 3 and 9.

Prebuild. A lever on the lever menu and a category on the inventory map: units made ahead in months with hours to spare, for months without them, with a start date and an end date. Its cost is carrying. Riverton's March plan built 216 RD-450-class drives ahead in April and May. Chapters 5 and 6.

Price variance. A change in what a unit sells for or costs, multiplied by the units in the plan. Chapter 8.

Process health. The four rows of the SIOP scorecard that say whether the cycle itself ran: data published on time, attendance with decision rights, decisions made and logged, and actions closed on time. Chapter 10.

Process measures. The four rows of the SIOP scorecard that say whether the plan's inputs and its execution were sound: forecast accuracy, bias, schedule attainment at the constraint and inventory record accuracy. Chapter 10.

Quantity variance. A change in the number of units, multiplied by what each was planned to earn. Chapter 8.

RACI. A matrix of rows and seats that says who is responsible (R), accountable (A), consulted (C) and informed (I) for each part of the plan and each step of the process. Rows are parts of the plan, columns are seats rather than names, and each A initials his or her row. Chapter 3.

Rebate. A deduction paid back to a customer after the sale, usually for volume. Corvane's contract carried two percent from May. Chapters 7 and 8.

Rehearsal. The first executive meeting, run once with stand-ins and no executives, the day after the first pre-SIOP, to time every page and cut every page that neither leads to a decision nor explains one. Riverton's cut a twenty-six-page pack to fourteen. Chapter 12.

Riverton Industrial Products. The company in this book: drives from Muncie, Indiana, rollers and kits from Joplin, Missouri, about 560 people and $151.4 million of net sales last year. Invented. How to Read This Book.

Rough-cut capacity. The planners' name for the capacity check — rough because it tests families against one resource, not every order against every machine. Chapter 5.

Rules of the room. Four rules for the executive meeting, read aloud at the first one: a decision made in the room is made once, no new data in the meeting, a member sends a named alternate with the same decision rights or nobody, and the SIOP lead runs the agenda while the CEO chairs. Chapter 3.

S&OP (sales and operations planning). The older name for the process this book teaches, given its modern form in the 1980s. How to Read This Book.

Safety stock. The inventory that covers uncertainty — the forecast that misses and the replenishment that runs late — set by arithmetic: z times σ times the square root of the replenishment time. Riverton's rollers needed 11,756. Chapter 6.

Sequential substitution. How the walk-forward computes its steps: each one with the steps before it already in, so each measures only what it names. Change the order and the size of the steps changes, but the total stays the same. Chapter 8.

Service promise. OTIF targets set customer segment by customer segment, each with its cost in inventory and capacity written beside it. Riverton promised Corvane 98 percent, aftermarket kits 97 and everyone else 95. Chapter 6.

SIOP (sales, inventory and operations planning). A monthly cycle that produces one plan for demand, supply and profit, eighteen months long, in units and dollars, carried to the gross margin line and decided by the leadership team with the CEO in the chair. How to Read This Book.

SIOP calendar. The five steps of the cycle, each due by a business day counted from the start of the month, set twelve months ahead and published to every member. Chapter 3.

SIOP charter. One signed page that sets up the cycle: the executive owner, the SIOP lead, the members by seat, the four decisions, the scope, the calendar and what the cycle will not do. Chapter 1.

SIOP lead. The person who runs the process — the calendar, the dataset, the pre-SIOP and the pages for the executive meeting — and owns no number in the plan. At least half of one person's time, and a full-time job by the sixth cycle. At Riverton, Megan Albright. Chapters 1, 3 and 11.

SIOP scorecard. Fewer than twenty measures, each defined once, owned by one name and read against a tolerance band, that tell the executive meeting whether last month's plan was right and whether the process that made it ran. Riverton's had fourteen. Chapter 10.

Six-cycle rule. No planning software until the process has run six cycles on time without it. A late cycle doesn't count toward the six. Chapter 11.

SKU (stock-keeping unit). One orderable product. The plan is made by family and goes down to the SKU only by exception. Chapter 2.

Source of record. The one system whose value wins when two disagree. Chapter 2.

Spread. The result of the three-number test: the highest answer minus the lowest, divided by the middle one. Under five percent, you're running one company. Over five, more than one. Over ten, the plants are building to one of them. Riverton's was 13.9 percent. Chapter 1.

Standard cost. The cost of making and shipping one unit at standard: material, labor, overhead and freight. A Riverton drive averaged $1,130. Chapters 2 and 7.

Standard net price. List price less the standard deductions. A Riverton drive averaged $1,720 at list, $120 of deductions and $1,600 net. Chapters 2 and 7.

Statistical baseline. The first of the three layers: thirty-six months of shipments by family, with the trend and the seasonal shape drawn out of them and nothing added. Chapter 4.

Supply planner. The person who tests demand against capacity at the constraint and writes the gap sheets. At Riverton, Irene Tamberg, Muncie's master scheduler, on half her time. Chapters 3 and 5.

Supply review. The third step of the cycle, by business day 9, where the supply planner tests the demand against capacity at the constraint and the head of operations approves the supply plan and names its gaps. Chapters 3 and 5.

Target. What the Board asked for. A target doesn't move when the forecast moves, and it shouldn't. Chapter 4.

Three causes, the. Every variance gets one of three labels, because each takes a different fix: a data problem (a number was wrong), an assumption change (the world moved) or an execution failure (we didn't do what we planned). Chapters 8 and 10.

Three-cause sheet. One row per miss outside its band: the measure, the miss, the cause, the root cause, the fix, the owner and the date. Chapter 10.

Three layers, the. The way the demand view is built: the statistical baseline, the known changes and the assumptions, each on its own line, so a judgment can't be buried inside a history. Chapter 4.

Three-number test. Asking the heads of sales, finance and operations, separately and on the same day, for next quarter's net sales, and measuring the spread. Chapters 1 and 12.

Tie-out. The reconciliation of the planning dataset to the general ledger, every difference written down, named and owned. Riverton's February dataset of $12,617.2K tied out to the ledger's $12,442.8K in six lines. Chapter 2.

Time fences. The points that say how freely the plan may change. At Riverton the schedule is frozen inside four weeks at the gear cell and two at Joplin, slushy out to twelve weeks and liquid beyond. Chapter 5.

Tolerance. In the demand review, the movement against the last cycle that brings a line up for discussion. Riverton's was five percent in any month. Chapter 4.

Tolerance band. The range inside which a scorecard measure isn't discussed, set before the cycle from the measure's own history and changed only in the cycle review. Chapter 10.

Tradeoff sheet. One decision on one page: the options side by side, each option's effect on service, inventory and cost, the choice and its owner. Chapter 6.

Trigger. The event that would change an assumption, named so clearly that anyone could see it happen. Riverton's first was Corvane's site-readiness report. Chapter 4.

Unconstrained demand. What customers will buy, stated before anyone asks whether the plants can make it. The demand review publishes it, and the supply review tests it. Chapter 4.

Unit of measure. The one unit a planning family is counted in, from the customer's forecast to the plant's schedule. Riverton plans drives in units, rollers in pieces (never cases) and kits in kits. Chapter 2.

Walk-forward. The bridge from last cycle's gross margin for the year to this cycle's, in whole thousands of dollars, step by step in a fixed order — the month just closed against its estimate, then volume, price, deductions, material, freight, energy, and labor and outside cost — with one cause, one owner and one sentence for every step. Chapter 8.

Notes on Sources

This book rests on three things: the PGOS SIOP Masterclass of The 80/20 Institute, the way I have run the cycle in industrial companies over three decades, and a short list of published sources, every one of which is named below.

Riverton Industrial Products, its people, Corvane, Delmore Castings and Pell Gear Works are invented, and they have no source to cite. The mechanics of the cycle as this book runs them — the three-number test, the charter, the calendar by business day, the walk-forward in a fixed order, the decision log, the scorecard, the six-cycle rule and the ninety-day rollout — are how I run SIOP and how the Institute teaches it. They carry no citation either. They are the book. *A Note on Names and Numbers* explains how Riverton was assembled, and every Riverton figure and date matches *Nerve Center · The Field Guide* exactly.

Where a chapter says what I expect to find in a company, it is stating my own working rule, drawn from practice, not a measured result. Every epigraph and every From the Record entry has a documented source, listed below by chapter. Web sources were checked on 9 and 10 October 2026.

The method. Sales and operations planning took its modern form in the 1980s, and its standard early statement is Richard C. Ling and Walter E. Goddard, *Orchestrating Success: Improve Control of the Business with Sales & Operations Planning* (Oliver Wight Publications, 1988, reissued by John Wiley & Sons in 1989). Planning by family, the capacity check against one resource and the formula for safety stock belong to the long practice of production and inventory planning, set out at full length in Edward A. Silver, David F. Pyke and Douglas J. Thomas, *Inventory and Production Management in Supply Chains*, 4th ed. (Boca Raton, FL: CRC Press, 2017). The idea that one resource sets the pace for a whole plant, and that its hours should be ranked and protected, was made famous by Eliyahu M. Goldratt and Jeff Cox, *The Goal* (North River Press, 1984).

Gross margin per constraint hour as it is used here comes from *The 80/20 Company*, which teaches it as profit velocity.

The author's other books. When a chapter crosses onto ground another of my books owns, it names that book once and keeps going. *The Strategy Management Process* — strategy and the annual plan. *The Strategy Deployment Process* — the bowler, the countermeasure and the monthly business review. *The 80/20 Company* — SIOP inside a company's second year, and profit velocity. *Get Paid* — price, the surcharge and the escalator. *FORGE* — the CEO's operating cadence. *The Rule of Three: How Visionaries, Prophets, and Operators Make Your Business Unstoppable* (Matt Holt Books / BenBella, 2026) — who does what. Where a chapter opens with a line from one of these books, the line is verbatim and the source is named beneath it.

The four rules for tools in How to Read This Book are the author's. No AI product, company or study is named in the chapters, on purpose, so that the rules stay true as the tools change.

How to Read This Book

Epigraph. Bill Canady, *FORGE* (2026), chapter 9, my own book.

Whose method it is. On Richard Ling and the origins of the process, Ling and Goddard (1988), cited above under the method. The Navy's plan of the day is from my own service.

Chapter 1 — Give the Business One Plan

Epigraph. Henri Fayol, *General and Industrial Management*, trans. Constance Storrs (London: Sir Isaac Pitman and Sons, 1949), first published as *Administration industrielle et générale* (Paris, 1916). The line is Fayol's definition of unity of direction, one of his fourteen general principles of management.

Standard time, November 18, 1883. Ian R. Bartky, "The Adoption of Standard Time," *Technology and Culture* 30, no. 1 (1989): 25–56, which quotes William F. Allen's account of noon in New York, and Bartky, *Selling the True Time: Nineteenth-Century Timekeeping in America* (Stanford, CA: Stanford University Press, 2000). Allen's two maps and the 570 railway managers he mailed are from Simon Garfield, *Timekeepers* (Edinburgh: Canongate, 2016). Counts of the railroad times before November 18 vary, and about fifty is the usual figure (Garfield gives forty-nine). Allen's plan had five zones, and four were used, because the

Intercolonial Railway kept Eastern time. Chicago's nine minutes follow from its longitude, a little over two degrees east of the ninetieth meridian. The International Meridian Conference of 1884 fixed the prime meridian and did not create the time zones. Standard Time Act, March 19, 1918, 40 Stat. 450.

Chapter 2 — Agree on the Numbers

Epigraph. Charles Babbage, *Passages from the Life of a Philosopher* (London: Longman, Green, Longman, Roberts, & Green, 1864), chap. V, "Difference Engine No. 1," 67. The ellipsis marks one omitted sentence, about which House of Parliament each questioner sat in.

Mars Climate Orbiter, September 23, 1999. *Mars Climate Orbiter Mishap Investigation Board Phase I Report* (NASA, November 10, 1999), for the root cause, the units, the altitudes, the times and every quotation about the working level, informal reports, e-mail and the fifth course correction. Edward Weiler's sentence is from NASA/JPL release 99-113, "Mars Climate Orbiter Team Finds Likely Cause of Loss" (September 30, 1999). The orbiter's cost of about $125 million is the figure reported at the time, for instance by Robert Lee Hotz, "Mars Probe Lost Due to Simple Math Error," *Los Angeles Times*, October 1, 1999. The larger figure sometimes quoted, $327.6 million, covers two spacecraft.

Chapter 3 — Set the Calendar and Name the Owners

Epigraph. Aristotle, *A Treatise on Government* [*Politics*], trans. William Ellis (London: T. Payne, B. White and T. Cadell, 1776), bk. II, chap. III, in the Everyman's Library edition (London: J. M. Dent, 1912). The sentence opens with "for" and continues past a semicolon. The epigraph prints the clause between them.

Chapter 4 — Build the Demand View

Epigraph. Edmund Burke, *A Letter from Mr. Burke, to a Member of the National Assembly, in Answer to Some Objections to His Book on French Affairs* (Paris and London, 1791), reprinted in *The Works of the Right Honourable Edmund Burke*, vol. 4. Burke was writing about politics, not demand. The sentence holds for both.

FitzRoy's forecasts, 1861. Robert FitzRoy, *The Weather Book: A Manual of Practical Meteorology* (London: Longman, Green, Longman, Roberts

& Green, 1863), 171, for the side heading and the definition. The Met Office's National Meteorological Archive, for the Royal Charter storm, the Meteorological Department of 1854, the coastal reports of 1860, the storm warnings of 1861 and the first forecast in *The Times* of August 1, 1861. Francis Galton, *Memories of My Life* (London: Methuen, 1908), on the review of 1866. Peter Moore, *The Weather Experiment* (London: Chatto & Windus, 2015). Figures for the dead of the *Royal Charter* run from about 450 to 459. FitzRoy did not coin the word forecast, which is centuries older.

Chapter 5 — Test What Supply Can Deliver

Epigraph. Thomas Reid, *Essays on the Intellectual Powers of Man* (Edinburgh, 1785), Essay VII. Reid was writing about arguments. The phrase about a chain and its weakest link has been applied to everything since.

The Red Ball Express, 1944. Roland G. Ruppenthal, *Logistical Support of the Armies*, vol. I, *May 1941–September 1944* (Washington: Office of the Chief of Military History, 1953), 559–72, for the route, the rules of the road, the first day, August 29, the fuel the trucks burned and the cost in repairs. Ruppenthal, vol. II, *September 1944–May 1945* (1959), chaps. IV–V, for the end of operations on November 16, the 412,193 tons and the opening of Antwerp on November 28. Hugh M. Cole, *The Lorraine Campaign* (Washington: Historical Division, 1950), chap. I, for Third Army's gasoline on August 30 and its halt. Ulysses Lee, *The Employment of Negro Troops* (Washington: Office of the Chief of Military History, 1966), 633–34, for the 73 percent of truck companies. Lee dates the end to November 13, which is why the chapter says mid-November.

Chapter 6 — Make the Inventory and Service Tradeoffs

Epigraph. Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (London: W. Strahan and T. Cadell, 1776), bk. II, chap. I, "Of the Division of Stock."

Safety stock. The formula is the standard one, set out in Silver, Pyke and Thomas (2017), cited above under the method.

Valley Forge, 1777–78. George Washington to Henry Laurens, December 23, 1777, Founders Online, National Archives, and *The Papers of George Washington, Revolutionary War Series*, vol. 12, ed. Frank E. Grizzard Jr. and David R. Hoth (Charlottesville: University of Virginia Press, 2002). John Chaloner's report of January 4, 1778, and Washington to

James Mease, January 21, 1778, in vol. 13 of the same series. The Committee at Camp to Governor Thomas Johnson of Maryland, February 16, 1778, *Archives of Maryland*, vol. 16, 503. Greene's appointment: *Journals of the Continental Congress*, 10:210–11. The deaths and their causes: National Park Service, Valley Forge National Historical Park. Erna Risch, *Supplying Washington's Army* (Washington: Center of Military History, 1981), for the commissary and the wagons.

Chapter 7 — Translate Units into Dollars

Epigraph. Luca Pacioli, *Summa de arithmetica, geometria, proportioni et proportionalità* (Venice, 1494), "Particularis de computis et scripturis," chap. 34, in John B. Geijsbeek, *Ancient Double-Entry Bookkeeping: Lucas Pacioli's Treatise* (Denver: John B. Geijsbeek, 1914), 73. The epigraph begins partway through Geijsbeek's sentence and capitalizes its first word.

Chapter 8 — Explain What Changed

Epigraph. Francis Bacon, *Novum Organum* (1620), bk. II, aphorism XX, in *The Works of Francis Bacon*, ed. James Spedding, Robert Leslie Ellis and Douglas Denon Heath, vol. 4 (London: Longman, 1858), 149. The sentence opens "And yet since," and the epigraph prints the clause that follows.

The discovery of Neptune, 1846. Urbain Le Verrier's memoirs in the *Comptes rendus* of the Académie des Sciences, vols. 21–23 (1845–46). Jacques Laskar, "Des premiers travaux de Le Verrier à la découverte de Neptune," *Comptes Rendus Physique* (2017). Davor Krajnović, " 'That star is not on the map': the German side of the discovery," in William Sheehan and others, eds., *Neptune: From Grand Discovery to a World Revealed* (Cham: Springer, 2021). How far the planet lay from the prediction depends on how it is measured: 52 minutes of heliocentric longitude in Laskar, a little over a degree on the sky in Krajnović, so the chapter says about a degree. Galle's letter of September 25 and Arago's phrase are given in translation.

Chapter 9 — Run the Decision Cycle

Epigraph. Harry S. Truman, "The President's Farewell Address to the American People," January 15, 1953, in *Public Papers of the Presidents of*

the United States: Harry S. Truman, 1952–53 (Washington: Government Printing Office, 1966), 1197–1202. The typed text uses double hyphens, set here as dashes.

Nelson's memorandum, 1805. Sir Nicholas Harris Nicolas, ed., *The Dispatches and Letters of Vice Admiral Lord Viscount Nelson*, vol. 7 (London: Henry Colburn, 1846), for Nelson's request that no salute be fired and no colors hoisted, his arrival on the evening of September 28, the letter to Lady Hamilton of October 1 and the memorandum of October 9. The letter was first printed in *The Letters of Lord Nelson to Lady Hamilton*, 2 vols. (London: Thomas Lovewell, 1814). Nelson's own draft of the memorandum is British Library Add MS 37953, and copies issued over his signature to individual captains survive, among them the *Leviathan*'s at the National Maritime Museum, Greenwich. The numbers of ships on October 21 are Royal Museums Greenwich's. The times of Nelson's wound and death are from William Beatty, *Authentic Narrative of the Death of Lord Nelson* (London: T. Cadell and W. Davies, 1807).

Chapter 10 — Measure and Improve the Process

Epigraph. Bill Canady, *The Rule of Three* (2026), chapter 5, my own book.

The Plimsoll line, 1876 and 1890. Samuel Plimsoll, *Our Seamen: An Appeal* (London: Virtue & Co., 1873). The losses of 1871 are as given in Nicolette Jones, *The Plimsoll Sensation* (London: Little, Brown, 2006), from Board of Trade figures. House of Commons debate of July 22, 1875, Hansard, 3rd ser., vol. 225. Merchant Shipping Act 1876 (39 & 40 Vict. c. 80), s. 26, for the disc and the owner's choice of where it went. The Merchant Shipping Act 1890, which fixed the line by the Board of Trade's freeboard tables, and the Merchant Shipping Act 1894 (57 & 58 Vict. c. 60), s. 438, which consolidated it. Lloyd's Register Foundation, Heritage and Education Centre, "The Plimsoll line," for the freeboard tables and Lloyd's Register's part in them. Disraeli moved that Plimsoll be reprimanded, the matter was put off for a week, and Plimsoll apologized. He was not suspended, whatever some later accounts say.

Chapter 11 — Raise the Process a Level

Epigraph. Samuel Smiles, *Self-Help* (London: John Murray, 1859), chap. III, "Application and Perseverance," 52. In the revised edition of 1866 and later printings it is chapter IV.

John Harrison's timekeepers, 1736–1765. Rupert T. Gould, *The Marine Chronometer: Its History and Development* (London: J. D. Potter, 1923), for the *Deptford*'s voyage, the longitudes off Madeira, Porto Santo at six in the morning, the Jamaica result on a rate fixed after the voyage, the Board of Longitude's refusal of August 17, 1762, and the Barbados result. Royal Museums Greenwich, the object records for H1 to H4 and "Who was John Harrison?", for the dates of the four timekeepers, H4's weight and the Board's verdict of February 1765. Humphrey Quill, *John Harrison: The Man Who Found Longitude* (London: John Baker, 1966). Gould puts the Barbados error at 38.4 seconds and later accounts at 39.2, so the chapter says under forty seconds. The Longitude Act of 1714 offered £20,000 for longitude within half a degree. Parliament's further £8,750 came in 1773.

Chapter 12 — Put the First Three Cycles to Work

Epigraph. William Shakespeare, *Henry V*, act 4, scene 3, in the Folger Shakespeare text (Washington: Folger Shakespeare Library), which prints the line without a comma. The play dates from 1599.