

The Goal: A Process of Ongoing Improvement



INTRODUCTION

BRIEF BIOGRAPHY OF ELIYAHU M. GOLDRATT AND JEFF COX

Eliyahu Goldratt was born into a Rabbinic Jewish family in 1947, the year before Israel achieved official statehood. His father was Israeli journalist and politician Avraham-Yehuda Goldratt. Eliyahu Goldratt obtained his Bachelor of Science degree in Tel Aviv before moving to Ramat Gan, Israel, where he earned his Master of Science and Doctor of Philosophy degree. After spending years consulting for Israeli manufacturers, Goldratt joined a software company to help develop a new technology that could optimize production schedules for factories. Although many publications lauded the technology as a revolutionary tool, Goldratt realized that managers often held their same backwards assumptions that they had before using the tool, even after trying to implement it in their factories, which negated any positive effects. To try to explain why managers must change their basic assumptions, Goldratt spent 13 months writing his debut business novel, *The Goal*, which conveyed the basic principles that drove his company's technology. Although the book eventually became successful, Goldratt and his shareholders noticed that managers were now using their principles but not buying their company's technology, which eventually led to declining sales and Goldratt's termination. Even so, Goldratt continued writing business books and building on his Theory of Constraints that he introduced in *The Goal*. He formed research and consulting groups, and he developed several more influential manufacturing management concepts such as Thinking Processes, the Drum-Buffer-Rope method, and Critical Chain Project Management. Through the course of his career, Goldratt continually pushed businesspeople to challenge their own assumptions and rethink traditional processes. He died of cancer in 2011 in Israel. Jeff Cox is the co-author of numerous business novels. He co-authored *The Goal* early in his writing career in 1984, and he's since contributed to such best-selling business novels as *Hanging Fire*, *Selling the Wheel*, *The Quadrant Solution*, and *Zapp*.

HISTORICAL CONTEXT

The Goal was published in 1984, a time when the post-World War II manufacturing boom began to slow and American businesses like Alex Rogo's manufacturing plant subsequently faced new challenges. American corporations were up against rising competition from manufacturing corporations around the world, particularly in Asia, who could produce products for less money and offer them at a lower price. As American

consumers leaned toward lower-priced goods, the role of manufacturing in America's economy began to fall, initiating a postindustrial era. Consequently, the majority of the American economy shifted toward service industries such as food, healthcare, technology, engineering, and finance.

RELATED LITERARY WORKS

Over the course of his career, Goldratt developed numerous management and manufacturing innovations which he disseminated by writing business novels and non-fiction manuals. In 1986, he followed *The Goal* up with *The Race*, in which he explains his Drum-Buffer-Rope concept, which elaborates on the Theory of Constraints and lays out its application more technically in a manufacturing environment. In 1994, Goldratt published his business novel, *It's Not Luck*, which further demonstrates how to implement the Theory of Constraints in distribution and marketing, rather than just manufacturing systems. His follow-up novel, *Critical Chain*, in 1997 extends his Theory of Constraints into the world of project management and lays out his Critical Chain Project Management theory, which involves creating non-work activity buffers to help employees increase their focus. Other popular business self-help books include Stephen Covey's *The 7 Habits of Highly Effective People* and Spencer Johnson's *Who Moved My Cheese?*, which take a similar approach to *The Goal* in helping readers tackle issues in both their professional and personal lives.

KEY FACTS

- **Full Title:** The Goal: A Process of Ongoing Improvement
- **When Written:** 1982
- **Where Written:** Israel
- **When Published:** 1984
- **Literary Period:** Contemporary
- **Genre:** Business Novel
- **Setting:** The fictional, small American town of Bearington
- **Climax:** Alex Rogo saves his manufacturing plant and is promoted to be the new division manager.
- **Antagonist:** Hilton Smyth
- **Point of View:** First Person

EXTRA CREDIT

Looking Ahead. In the final chapters of *The Goal*, Alex and his staff members each lay out their future goals—what systems they want to innovate and improve upon. Goldratt appears to have been listing his own goals through his characters, since he

went on to write novels and nonfiction books on every one of the problems his characters list.



PLOT SUMMARY

Alex Rogo manages a failing manufacturing plant for the company UniCo in a small American town. One day, he arrives at work to find his corporate division manager, Bill Peach, waiting for him. Peach is angry about a customer order that is months overdue, as are most of the orders in Alex's plant. He tells Alex that the outstanding order must be shipped by that evening, and that if Alex can't turn the plant around within three months, Peach will shut it down. Alex and his production manager, Bob, manage to push everyone in the plant and fulfill the order by that night, but Alex knows that they can't keep operating the plant in such a hectic fashion. Worse yet, Alex's wife, Julie, wants to go out with him that evening, but Alex has to spend all evening at the plant, as he often does, which upsets her.

While at a division meeting, Alex has the sense that nobody in their division has any real idea how to successfully manage a manufacturing system. He remembers advice that an old mentor, Jonah, gave to him two weeks ago when he ran into Jonah at an airport: though they hadn't seen each other in years, within minutes of Alex talking about the plant, Jonah intuited exactly what problems it has. Jonah advised Alex that he needs to determine the overall goal of the manufacturing plant. Now restless at the division meeting, Alex abruptly leaves to be alone and think. After several hours, he decides that the goal of any business must be to make money, and thus he can measure the productivity of any action by whether it helps the plant make money. Alex discusses this idea with Lou, his chief accountant. Lou agrees that it makes sense, but he thinks they would need particular metrics with which to measure that goal.

Alex calls Jonah and Jonah explains to determine whether the plant is making money, Alex only needs to measure three things: throughput, inventory, and operating expense. "Throughput" describes the money that a manufacturing system makes from sales. "Inventory" describes the money contained in that system as raw material or equipment. "Operating expense" describes the money required to turn inventory into throughput. The next day, Alex presents these new metrics to Bob, Lou, and Stacey, the plant's inventory control manager. They discuss whether the plant's newly-acquired robots, which are efficient in that they are always operating, actually generate more throughput or waste money by doing unnecessary work and creating unnecessary inventory. They still feel uncertain, so Alex decides to take an overnight flight to meet with Jonah and ask for advice. However, Julie is angry at Alex for his unannounced travel plans. In New York, Jonah warns Alex that a plant where everyone is always busy is a wasteful and inefficient plant at

risk of going bankrupt, since, as a set of "dependent events," the manufacturing process can be ruined by "statistical fluctuations." Alex doesn't understand, but Jonah is late for a meeting and leaves.

When Alex gets home, he and Julie fight about how little time he spends with her. He promises to spend the entire weekend with her, but on Saturday he realizes that he promised to go with his son, Dave, on an overnight Boy Scout hike. During the hike, Alex realizes that the **hikers** are a set of dependent events like stages in a manufacturing system, and each of their fluctuations in hiking speed causes compounding delays for everyone behind them in line. However, he also realizes that by placing the slowest kids at the front of the line and the fastest kids at the back, he can mitigate the amount of delays and disorder that arises.

Alex is excited about what he has learned and believes he can put it into practice at the plant. However, when he and Dave get home from the hike, he discovers that Julie has left him. He asks his mother to move in and help him take care of the kids while he deals with work and figures out where Julie went.

Meanwhile, Alex observes the same compounding delays due to statistical fluctuations in the plant, even when each machine and person is individually efficient. Alex and his staff realize that they need to optimize their entire manufacturing system rather than focus on individual efficiencies. When Alex reports this to Jonah, Jonah tells him his next step is to identify the "bottlenecks" in his plant, the machines and resources that are the slowest due to their limited capacities, since these slow down the entire manufacturing system. Alex and his staff realize that they have two bottleneck machines, neither of which can be sped up, and through which most of the parts they make must go. Jonah advises that since the bottlenecks are the slowest component of the manufacturing system, if they can increase their bottlenecks' capacity, they can increase the capacity of the entire system, which will raise their throughput. Jonah gives them advice on how they can improve the way they operate their bottlenecks to increase their capacity, and Alex and Stacey develop a tagging system to organize which parts need to be processed by bottleneck machines.

Alex finds out that Julie is living with her parents and considering divorce. To prevent this, he starts going to see her several times a week, and they even start going on dates together. Meanwhile, the plant shows real improvement by lowering its stock of excess inventory and shipping orders on time. Within two months, the plant is profitable again. Jonah teaches Alex how to let the bottleneck machines regulate the pace of the entire system and maintain a steady flow of manufactured products. However, despite their good progress, Peach is unimpressed and tells Alex that he needs to see an astronomical 15-percent improvement in their third month, or he will still close the plant. Alex is disheartened, but Jonah feels confident they can deliver. As their next major step, Jonah

advises that Alex cut the batch sizes in half, which halves the time that parts spend waiting to be processed and further increases their production rate. Alex and Julie spend more time together and continue mending their relationship—after a few weeks of dating, Julie moves back into their home. Meanwhile, Johnny Jons, in charge of UniCo's division sales, praises Alex for helping him land and execute difficult orders.

By traditional accounting methods—which don't conform to the way Alex's plant now operates—Alex's plant does not meet Peach's 15-percent growth demand. However, at Alex's monthly performance review, Peach reveals that he, Ethan Frost (Peach's chief accountant), and Johnny Jons are being promoted to the next level of corporate administration. They are so impressed with Alex's work that Peach promotes Alex to be the new division manager, recommending that Alex spend his remaining two months at the plant preparing for his new role. Alex asks Jonah for help preparing, and Jonah encourages Alex to determine what he wants to learn. Alex decides that he wants to learn how to manage organizations of any size or scale and how to better manage his personal life.

Alex and Julie make an effort to share their thoughts and feelings with each other on a daily basis. Meanwhile, with his staff's help, Alex prepares for his role as division manager. He asks Lou and Bob to move up to the division level with him, but only Lou accepts the offer. Lou states that he wants to devise better cost accounting metrics that give a more accurate description of a business's health. Bob wants to become the plant manager in Alex's stead and master plant-level production processes. Alex spends the next two months learning and handling minor issues at the plant. With their new capacity, Alex and Lou help Johnny Jons land a contract with a large French client, helping their company make its first break into the European market. Alex and Lou continue to study and prepare, seeing that they have a hard task in front of them if they are to reform the entire manufacturing division.

he is doing wrong, Alex asks a former mentor, Jonah, for advice on how to reform his business. Jonah teaches Alex about maintaining clear goals in any endeavor, especially in business, and he provides Alex with simple metrics to measure his progress toward that goal. Furthermore, Jonah teaches Alex how to identify the bottlenecks or constraints in his manufacturing system and utilize them to his advantage. With Jonah's principles and his management staff's support, Alex manages to make his plant the most profitable plant in the entire division. He also learns to share his life with Julie and begins to mend their relationship and to set aside more time for his kids. Rather than fire him, Bill Peach is so impressed by Alex's progress that when Peach is promoted into the next corporate level of management, he promotes Alex to take over his role as division manager. In the final chapters of the story, Alex works with his staff to utilize Jonah's business advice to help him manage a massive organization and learn to approach business problems as Jonah does: like a scientist. Alex's transition from failing manager and husband to successful manager and family man ultimately demonstrates the power of using clear goals to manage all aspects of one's life.

Jonah – Jonah is a scientist who becomes a business theorist and helps Alex save his plant. Alex, Jonah's former student, reconnects with Jonah randomly in an airport. When Alex talks about his plant, Jonah intuits all the problems that the plant has, even without Alex mentioning them. Throughout the story, Jonah uses the Socratic method—asking questions and pushing someone to reach a conclusion on their own—to lead Alex to see his business differently, maintain clear goals, and work within the manufacturing system's natural constraints. Jonah constantly travels, so he only appears in the story occasionally through brief meetings or phone conversations. Jonah represents author Eliyahu Goldratt in the story—significantly, both Jonah and Goldratt are Israeli business theorists who take a scientific approach to manufacturing problems—and Jonah voices Goldratt's ideas, concepts, and definitions. Because of this, Jonah functions more as a sage or guru than a fully-developed character. Beyond the fact that he smokes cigars frequently, Jonah has no background, no characterization, and no personal story arc beyond disseminating Goldratt's theories and advice. When Alex's plant becomes profitable again and Alex advances to become the division manager, Jonah disappears from the story.

Julie Rogo – Julie is Alex's wife. Both in the years preceding and during the story, Julie resents Alex's over-commitment to his career and feels that he neglects her, representing the negative impact that a corporate career can have on one's family members. Although Alex believes his work should come before family, Julie expects him to place his duties as a husband and father over his career. After he breaks promise after promise to spend time with her, Julie leaves him, moves in with her parents, and considers divorce. As Alex learns to better manage



CHARACTERS

MAJOR CHARACTERS

Alex Rogo – Alex Rogo, the protagonist of the story, manages a failing manufacturing plant for the corporation UniCo in the small American town of Bearington. Although Alex's plant appears efficient on paper and is full of knowledgeable, hard-working people, all their customer orders are months overdue and they struggle to maintain any sort of production schedule. In the beginning of the novel, Alex's division manager and boss, Bill Peach, tells Alex that he must turn the plant around in three months or Peach will close the whole thing down. Meanwhile, Alex is so preoccupied with business that he often neglects his wife, Julie, and his kids, Dave and Sharon; Julie feels so overlooked by him that she threatens divorce. Unsure of what

his life, he starts taking Julie on weekly dates. Julie and Alex talk about their differing expectations of marriage and decide to compromise. They agree that raising their kids and sharing their lives are apt goals for their marriage, and Julie moves back in with the family. In the end of the story, Julie starts reading Socrates and helping Alex find solutions to his workplace challenges.

Bob Donovan – Bob is Alex’s production manager at the plant. Although Bob has decades of production experience, he feels loyal to their traditional manufacturing practices. When Jonah proposes changing how the plant measures its productivity, advocates for letting some workers stand idle, and challenges Bob’s current understanding of expenses and profits, Bob puts up more resistance to the changes than anyone else. However, as Alex and his staff reform the plant and make it profitable again, Bob sees the wisdom in Jonah’s principles and cooperates with the new measures. When Alex is promoted to division manager, he offers Bob the chance to oversee production for the entire division. However, Bob decides that he wants to master plant-level production instead and chooses to take over Alex’s old job as manager of the Bearington plant.

Stacey Potazenik – Stacey is Alex’s inventory control manager at the plant. Even before Jonah arrives, Stacey recognizes that the plant’s steadily-growing inventory is problematic. When Alex wants to implement Jonah’s principles and change the way they manufacture, particularly regarding bottlenecks, Stacey is very receptive to the change. During meetings, she often contributes ideas and insight, including helping Alex refine his tagging system for bottleneck parts. When Alex becomes the division manager and Bob moves up to plant manager, Stacey steps into Bob’s former role as the production manager so that she can devise new protective measures to keep the plant’s flow from faltering.

Lou – Lou is Alex’s plant controller (chief accountant). Although Lou is both intelligent and experienced, Alex notes that he initially makes the same wrong assumptions as anyone else about why the plant fails (poor workers, labor union interference, and so on), suggesting that those flawed assumptions are ubiquitous among businesspeople. However, when Alex and his staff begin implementing Jonah’s new ideas, Lou quickly realizes that the traditional corporate metrics he uses to measure the plant’s performance are deeply flawed and outdated. Even after adopting Jonah’s guiding metrics of throughput, inventory, and operating expense, Lou recognizes that their cost accounting measures provide inaccurate data. As a result, Lou spends much of his time developing better ways to calculate expenses and measure efficiency, even going against corporate guidelines to do so. When Alex becomes division manager, Lou asks Alex to make him his division controller so that he can reform the division’s cost accounting methods and implement a new, more accurate system for all of their plants. Alex grants Lou’s request, and they prepare to take

over the division together.

Ralph Nakamura – Ralph is Alex’s data coordinator at the plant, measuring statistics and operating the computers. Although Ralph is part of Alex’s senior staff and participates in implementing Jonah’s ideas, he plays a lesser role in the group. When they start looking for trends in operations data, Ralph quickly realizes that the plant’s data collection systems are years out of date, and he spends much of his time trying to set up better data collection measures. In the end of the story, when Alex and his staff are figuring out how to organize the new information Alex gathers as division manager, Ralph recounts the story of Dmitri Mendeleev, the chemist who established the periodic table of elements. Ralph posits that, just as Mendeleev discovered an “intrinsic order” to the elements, perhaps such an “intrinsic order” exists in any set of data.

Bill Peach – Bill Peach is Alex’s boss and UniCo’s division manager for most of the story. In the opening of the novel, Peach confronts Alex about his failing plant and tells Alex that if he can’t turn it around in three months, Peach will close the entire plant. Although Peach appears infrequently in the story, Alex recalls that they used to be friends until the division started performing poorly, at which point Peach became high-strung and fearsome. However, Alex learns that just as he is at risk of losing his plant, Peach is at risk of losing the entire division, thus explaining his changed demeanor. Although Peach is slow to recognize Alex’s success, when Alex’s plant has several profitable months in a row, Peach admits that Alex has done a great job and that his methods are clearly effective. At the end of the story, rather than close the plant, Peach elects to keep it open and promote Alex as his new division manager, since he and his staff are moving up the corporate ladder as well.

Hilton Smyth – Hilton Smyth is a plant manager for UniCo, Alex’s rival, and the story’s only true antagonist. Smyth adheres strictly to traditional corporate methods and metrics, making him a foil for Alex, who embraces new ideas and revolutionizes his approach to management. Throughout the story, Smyth actively tries to undermine Alex and turn Peach against him, hoping to see Alex fail. However, when Alex’s plant succeeds and Smyth’s plant continues to struggle, Peach promotes Alex to a higher position than Smyth. Alex’s victory over Smyth thus represents the superiority of Goldratt’s innovative manufacturing practices over traditional corporate methods.

Dave Rogo – Dave is Alex and Julie’s young son and Sharon’s brother. Because of his career, Alex struggles to spend time with Dave. However, when Dave takes Alex on the Boy Scout overnight hike, Alex realizes that the **hikers** (who all hike at different speeds and thus delay one another) symbolize his manufacturing process, and that he can use them as a model for how to work with bottlenecks in the factory. As Alex learns to manage his plant better, he also starts spending more time with

Dave and inviting him to help him solve theoretical problems at the plant.

Sharon Rogo – Sharon is Alex and Julie’s daughter and Dave’s sister. Because of his career, Alex struggles to spend time with Julie, even though Julie yearns for attention from him. However, as Alex learn to manage his plant and personal life, he begins spending more time with Julie and letting her brainstorm solutions to problems at the plant with him.

Ethan Frost – Ethan Frost is Bill Peach’s division controller (chief accountant). Although Frost initially chastises Lou for abandoning traditional corporate metrics and devising his own, Lou eventually convinces Frost that the methods they use are deeply flawed. When Ethan Frost sees the revenue that Alex’s plant generates and listens to Lou’s explanations, he supports all of the innovations that Alex implements.

Johnny Jons – Johnny Jons is Bill Peach’s head of sales. Although Jons is skeptical when Alex asks him to generate more sales by promising quick delivery times, after Alex starts shipping complex orders in record time, Jons supports Alex in almost anything he wants to do. He also vouches for Alex’s effectiveness to Bill Peach.

Alex’s Mother – Alex’s mother lives in Bearington, the town in which Alex grew up and now runs his manufacturing plant. As a widower, Alex’s mother lives alone and rarely sees Alex or his kids, Dave and Sharon. However, when Julie leaves Alex, Alex’s mother moves in to take care of Dave and Sharon, since Alex is rarely home. Alex’s mother encourages Alex to start sharing his life and his concerns more frequently with his children.

MINOR CHARACTERS

Bucky Burnside – Bucky Burnside is a client of Alex’s plant. In the beginning of the story, Burnside is furious because his order is months overdue. However, when Alex delivers a difficult order for Burnside in a short amount of time, Burnside makes Alex’s plant his preferred supplier.

Ada – Ada is Julie’s mother, whom Julie goes to when she is considering divorcing Alex. Ada agrees with Julie that Alex neglects Julie in their marriage.

Herbie – Herbie is an overweight Boy Scout who is the slowest of the **hikers**. In the hikers’ symbolism of Alex’s plant, Herbie represents the bottleneck (the stage in the process with the lowest maximum capacity).

Fran – Fran is Alex’s secretary.

Mike O’Donnell – Mike O’Donnell represents the labor union in Alex’s plant.

Ron – Ron is one of the **hikers**.

Evan – Evan is one of the **hikers**.

Andy – Andy is one of the **hikers**.

Ben – Ben is one of the **hikers**.

Chuck – Chuck is one of the **hikers**.

Mike Haley – Mike Haley is a foreman at Alex’s plant who develops a faster way to operate the bottleneck heat-treating machine.

Neil Cravitz – Neil Cravitz is an auditor who reports to Ethan Frost.

Dick Pashky – Dick Pashky is a marketer who reports to Johnny Jons.

J. Bart Granby III – Granby is the CEO of UniCo.

Pete – Pete is a supervisor in Alex’s plant.

Ted Spencer – Ted Spencer is a supervisor in Alex’s plant.

Jane – Jane is Julie’s friend.

Eliyahu Goldratt – Goldratt is the primary author of the story, an Israeli business theorist and the creator of the revolutionary Theory of Constraints. Many businesspeople regard Goldratt as one of the most important thinkers of the 20th century.

TERMS

Throughput – Throughput is the money that a business generates through sales. A manager should keep their throughput as high as possible.

Inventory – Inventory is the money that exists within a business system in the form of equipment, assets, raw material, and so on. Anything that exists as inventory can be sold for money. However, inventory represents a financial burden, since it traps money within a system rather than leaving it available as cash on hand. A manager should keep inventory as low as possible without disrupting their throughput.

Operating Expenses – Operating expenses are the money invested in a system to convert inventory to throughput. Operating expenses are intangible and cannot be sold, such as human labor, energy bills, or the depreciated value of machines as they age. A manager should keep operating expenses as low as possible without disrupting their throughput.

Dependent Events – Dependent events are consecutive events in a system that directly affect one another. Every subsequent stage in a manufacturing system is a dependent event, since one cannot be completed until all the prior stages have been completed.

Statistical Fluctuations – Statistical fluctuations are variations in speed or quality as a result of human behavior. Any process that involves human operation will naturally and unavoidably have statistical fluctuations.

Bottlenecks – Bottlenecks are the slowest stage or member of a system due to limited capacity, which can be used to set the maximum pace for the entire system. A bottleneck’s capacity will always be less than or equal to the demand placed on it. A bottleneck is the same thing as a constraint.

Constraints – A constraint is the slowest stage or member of a system due to limited capacity, which can be used to set the maximum pace for the entire system. A constraint's capacity will always be less than or equal to the demand placed on it. A constraint is the same thing as a bottleneck.

Return on Investment (ROI) – Return on investment (ROI) measures how much money a business makes versus how much money it invests.

Net Profit – Net profit measures the actual profit a company makes after all working expenses have been paid.

Cash Flow – Cash flow measures the amount of money that comes into a business (in the form of profits) and the amount that comes out of the business (in the form of payments and expenses).



THEMES

In LitCharts literature guides, each theme gets its own color-coded icon. These icons make it easy to track where the themes occur most prominently throughout the work. If you don't have a color printer, you can still use the icons to track themes in black and white.



THE IMPORTANCE OF GOAL-SETTING

In Eliyahu Goldratt's business-management novel *The Goal*, Alex Rogo manages a failing industrial plant in small-town U.S.A. As Alex fights to keep his plant in operation, his over-commitment to his career threatens to ruin his marriage and cost him his family. In short, Alex is overwhelmed by the number of problems facing him both at work and at home, and he struggles to know which problems to put his energy into solving. However, when a mentor encourages him to establish clear goals for himself, Alex discovers that he can see how each problem interlinks and can determine steps to overcome them. Alex's struggle to protect both his manufacturing plant and his marriage thus demonstrates the importance of having clear goals in any endeavor.

In the beginning of the novel, Alex fails to manage the complex operations of his manufacturing plant or the emotional needs of his wife, Julie. This demonstrates how, without clear goals, both professional and personal endeavors can fall into disarray. As the novel opens, Alex's manufacturing plant is failing: every client order they have is months behind schedule. The plant has warehouses of unsold merchandise and unused materials, and it sells old equipment at a loss just to clear space for newly-built but unsold products. This failure mystifies Alex: although the plant's employees are highly capable and everyone works hard, the plant is always behind and has lost so much money that Alex's division manager, Bill Peach, is threatening to shut it down entirely. At the same time, Alex's marriage is fraying as

well. Because he spends so much time at the plant, Julie feels completely neglected and angry that he doesn't spend time with her or their kids. Alex constantly fails to keep his promises to his wife, and Julie eventually becomes so hurt that she moves out of their house and threatens to divorce him. In both his career and his personal life, Alex suffers from a lack of clear goals. He can sense that both his management of the plant and his relationship with his family are not working, but he does not know why, indicating that he has no clear vision of what his goal should be as a plant manager or as a husband. This demonstrates how, without clear goals, one's endeavors tend to fall into chaos, since one cannot even recognize *how* they are failing to do what one should be doing.

As Alex determines the primary goals of both his manufacturing plant and his marriage, he discovers that his first assumptions of what those goals should be are usually wrong, suggesting that the proper goal for any endeavor may initially seem counterintuitive. When Alex reconnects with a former teacher, Jonah—who is now a business guru—Jonah challenges Alex to determine the singular, simplest goal of his manufacturing plant. Alex assumes that the goal of his manufacturing plant is just to manufacture goods. When Jonah refutes this, Alex falls back on corporate jargon such as increasing efficiency, keeping overhead costs as low as possible, or making customers satisfied. Jonah again tells Alex that he is missing the singular goal of any business, including a manufacturing plant, suggesting that whatever Alex's proper goal may be, it is counterintuitive to the way Alex has been taught to think about his work. At the same time, while Alex tries to figure out why Julie is so upset with him, they fight over what the goal of their marriage to each other ought to be. At first, Julie thinks that their relationship shouldn't have any goals; it's just something that exists. Alex states that he thinks his goal should be to make lots of money so that Julie and their children can live well. This fails to placate Julie, indicating that whatever the goal of their relationship ought to be, it is counterintuitive—at least to Alex. When Alex does determine the main goal of his manufacturing plant (to make money), he realizes that it should have been obvious, except that it breaks with traditional business thinking. Alex quotes Mark Twain, saying, "Common sense is not so common at all," suggesting that such goals are often straightforward but also counterintuitive to one's first assumptions.

After Alex establishes clear goals for both his manufacturing plant and his marriage, he is able to take practical steps toward achieving those goals and managing his life better, demonstrating that proper goals are critical to success in any endeavor. When Alex realizes that his plant's goal must always be to make money, he is able to simplify the way he looks at problems with its manufacturing process. Rather than getting distracted by concerns such as each worker's individual output, fluctuating material costs, or new manufacturing technologies,

Alex's focus on this simple goal helps him decide which issues are truly important—in that they affect the plant's total profit after expenses—and which issues are secondary concerns. Thus, he can devote his limited time to finding solutions for the essential problems. With this focus, Alex ultimately turns the manufacturing plant profitable again, demonstrating the critical role of clear, simple goals in any corporate endeavor. At the same time, when Alex realizes that the most important goal of his marriage is to spend time with Julie and share his life with her, he is able to take simple steps to achieve that goal. Alex starts taking Julie out on weekly dates and, though he remains busy, makes a point of sharing his feelings and frustrations about work with her as well, so that they can navigate those challenges together. As with his work, Alex's goals for his relationship with Julie ultimately helps him to save their marriage, suggesting that clear and simple goals are the first step to success in any endeavor, whether in one's career or in one's personal life.



WORKING WITH CONSTRAINTS

Goldratt uses his book to introduce his Theory of Constraints: a novel way to understand and structure complex systems so that they run

smoothly. In Alex's manufacturing plant, every piece of every product they make must go through several consecutive stages of shaping, molding, and cutting in various machines before becoming a final product. However, so many different machines are involved that the plant struggles to keep a steady workflow—some machines always have a backlog of parts to get through, while other machines wait empty and idle, causing delays and an unpredictable pace for every subsequent stage of the manufacturing process. To solve this problem, Jonah (who represents Goldratt) teaches Alex that in order to optimize any multi-stage process like a manufacturing plant, one must identify the system's "constraints" or "bottlenecks"—the slowest stages of a process, which delay everything else—and then organize the entire system to work within the limits of those constraints.

Although every machine in the plant seems to cause delays, Jonah helps Alex to see that despite the plant's complexity, it only has two true bottlenecks that cannot be sped up. This suggests that in any complex system, there will be a relatively small number of actual constraints that slow the whole thing down. Since delays randomly occur at every machine, Alex thinks that all of those problems could not possibly be tied to one or two bottlenecks in their manufacturing process. However, with Jonah's help, Alex and his staff discover that whenever their process is delayed, the problem can be traced back to two vital but slow machines that are used for almost every product. Every other machine can work faster or adapt, but the bottleneck machines cannot. Since there is no alternative to either machine, whenever they are inactive and

waiting for parts, their inactivity causes a chain reaction of delays throughout the rest of the manufacturing process. Everything slows down as a result of those two machines, making them the system's bottlenecks, or constraints. Rather than a myriad of small issues, the plant struggles because of only two machines, suggesting that even in a complex system, the true number of constraints will be surprisingly small. Alex sees a version of this bottleneck effect during a hiking trip with his son, Dave's, Boy Scout troop. As the boys hike single-file, Alex realizes that rather than hiking as a group, the **hikers** spread out along the trail: the fastest kids race ahead while the slowest, Herbie, languishes behind, representing the group's bottleneck. Periodically, the others must stop and wait for Herbie to catch up, then start again and rebuild their momentum, causing their average hiking speed to be slower than the pace at which any of the boys would normally walk. Alex realizes that just as his manufacturing plant is thrown off pace—and thus, slowed down—by only two slow machines, so do the hikers struggle to maintain a steady pace due to one slow child, again suggesting that most systems are actually limited by a small number of constraints.

Alex realizes that by letting the bottlenecks set the pace for the entire manufacturing process, he can ensure that the bottlenecks are always running at maximum speed and the plant can maintain its peak production level, suggesting that one should prioritize their constraints rather than ignore them. In the manufacturing plant, Jonah advises Alex that by letting the bottlenecks set the pace of the entire plant, the two slowest machines will always be working at their full capacity. Although some other machines might be idle while waiting for the bottlenecks, as long as the bottlenecks are always running and never idle, the plant will already be making products as fast as it physically can. When Alex follows Jonah's advice, although some machines are not always operating, the plant maintains a more consistent pace than ever before. Thus, it has an overall faster rate of production, since there are no more delays caused by disorder or starting and stopping. Alex sees this effect during the Boy Scout hike, too: when he places Herbie at the front of the group and the fastest hikers in the rear, everyone can easily maintain the pace set by Herbie. Rather than spreading out all over the trail, the hikers stay together as a group, eliminating all the time they previously had to waste regrouping and making sure everyone was still accounted for. This demonstrates that by letting the slowest member of a group (the bottleneck) set the pace, the overall pace of that group will increase, as there is less time wasted on reorganizing or course-correcting, which causes delays.

With his entire manufacturing system running at an even, organized pace, Alex can see the whole process clearly enough to find subtle ways to speed up the bottlenecks as well. This suggests that by working within the Theory of Constraints, one can keep their system organized and predictable, giving them a

clearer understanding of their true constraints and possible solutions. With the manufacturing plant newly organized, productive, and predictable due to its steady pace, Alex and his staff realize that even their bottleneck machines can be slightly improved. They find faster ways to move products through the slowest machines that slightly lessens the bottleneck effect, allowing them to quicken the plant's pace and make more products and more money. Similarly, after learning to hike as a group, the Boy Scouts realize that Herbie is loaded down by his overly-heavy pack and offer to carry some of his gear for him, which lets him hike a faster and allows the whole group to quicken their pace. In each instance, both the hikers and the manufacturing plant are able to organize themselves and even lessen the natural constraints that they must deal with, which increases their capabilities. Goldratt's theory ultimately shows that leaders should recognize their constraints and make them the factor that paces an entire system, which will thus optimize that system's output.



INEFFECTIVE VS. EFFECTIVE BUSINESS METRICS

Alex's journey as a manufacturing plant manager forces him to set aside his traditional ideas about how businesses operate and consider new approaches. This is particularly true in how he and his management staff use metrics (systems of measurement) to determine their effectiveness as a business and make decisions about how to improve their operations. Through Alex's business advisor, Jonah (who represents author Eliyahu Goldratt himself), Goldratt proposes that businesses need to move beyond their traditional metrics, which are over-complicated and do not directly help businesses increase their profits. As such, Jonah teaches Alex that the traditional corporate metrics are often flawed and can be replaced by three simpler, more effective metrics that directly relate to a company's primary goal.

Alex's plant, and many of the plants in his division, appear to be doing well by traditional metrics, yet they fail to turn a profit or meet their own deadlines. This suggests that traditional metrics do not give an actual representation of a business's effectiveness. In the beginning of the novel, Alex and his management staff calculate the plant's effectiveness using traditional metrics. They focus on specifics like the relative efficiency of each individual machine (how much time it spends operating versus idle), number of products produced per man-hour, and the amount of money their raw material purchasers are able to save by buying discounted material. Alex and his staff place great emphasis on achieving good traditional metrics, since they must report these to their corporate managers and keep them satisfied, suggesting that traditional metrics are maintained and enforced by upper management in many companies. However, despite maintaining good traditional metrics, Alex's manufacturing plant is clearly failing.

Although the plant appears efficient on paper—at least in its individual parts—it consistently loses money, misses deadlines, and struggles to produce quality products at a reasonable speed. The disconnect between the plant's metric success and its financial failure implies that traditional corporate metrics do not give an accurate picture of a business's success.

After Alex sees that the traditional corporate metrics are failing to help him manage his plant, Jonah (and thus Goldratt) posits that nearly all of those metrics can be absorbed by three simple measures which directly describe a company's ability to make money: throughput, inventory, and operating expense.

"Throughput" describes the money that a business generates through sales. Although Alex wants to focus on the volume of products that his plant produces, Jonah insists that the only output that matters is the amount of money made from sales. Simply making products without selling them wastes money and thus detracts from their primary goal. Jonah advises that a business should keep its throughput as high as possible.

"Inventory" describes all of the invested money (assets) that exists within the plant, such as raw materials, manufacturing equipment, and unsold finished goods. Everything that counts as inventory could potentially be sold for cash, if need be. However, as long as something exists as inventory, it represents a financial burden since it exists as material goods instead of cash, which detracts from the goal of making money—even though inventory like manufacturing equipment is essential. According to Jonah, a business should keep inventory as low as possible without decreasing its throughput. "Operating expense" describes the cost of turning inventory, like raw materials, into throughput, as sales. Operating expense mainly describes things like employee labor (which cannot be sold off as an asset), energy bills, or the lost value of manufacturing machines as they wear out over time. Like inventory, Jonah states that a business should keep its operating expenses as low as possible while still maintaining its throughput. Although Alex is initially skeptical of such simple categories, Jonah argues that a company only needs to focus on these three major metrics to understand whether it is actually making money and thus achieving its goal. After following Jonah's advice, Alex realizes that using these three categories simplifies his understanding of how the manufacturing plant is running and how it is losing money by holding far too much inventory, even though the plant appears efficient on paper. Goldratt thus argues that these simpler, more holistic metrics of income and expenses give managers a better understanding of the health of their business than traditional corporate metrics do.

Despite Jonah's proposed new metrics of throughput, inventory, and operating expense, Goldratt suggests that the search for more effective business metrics will always be ongoing. At the end of the story, in spite of adhering to Jonah's new metrics and turning the manufacturing plant profitable again, Alex's chief accountant, Lou, states that rather than

retire, he wants to keep working for Alex and develop new metrics to replace their old “erroneous” methods of accounting. Even with Jonah’s guiding metrics, Lou’s determination to find new and better ways to measure business costs implies that new thinkers and leaders must always build and improve upon old methods—no system is perfect. Goldratt confirms this in his introduction to the novel. He describes his approach to business systems as “scientific,” but he reminds the reader that even scientific laws like the Law of Conservation of Energy are constantly reconsidered and improved upon. Goldratt states, “no exceptional brain power is needed to construct a new science or expand on an existing one [...] just the courage to face inconsistencies and to avoid running away from them just because ‘that’s the way it’s always been done.’” That is, even his own proposed metrics must be challenged and eventually discarded for better ones.



EFFICIENCY VS. OPTIMIZATION

Based on manufacturing plant manager Alex’s own experience and his corporate managers’ directives, Alex spends much of his energy trying to make the individual workers and machines in his plant as efficient as possible. He prides himself on the fact that his workers are rarely idle and everything is constantly moving—until his business advisor, Jonah, reveals to him that such efficiency, such constant busyness, is not a good objective to hold. As Alex learns to optimize his manufacturing plant (make it faster, less wasteful, and thus more profitable as a whole), he realizes that every laborer and machine operating at full capacity 100 percent of the time does not speed up their overall manufacturing process but actually slows it down. This suggests that a manager should try to optimize their entire system rather than focus on the efficiency of individual pieces.

Like everyone else in his corporate division, Alex initially (and wrongly) believes that his manufacturing process will work best when every machine and every worker are operating as efficiently as possible, suggesting that such devotion to efficiency is a common error among businesspeople. At the beginning of the novel, Alex and his management staff assume that if every worker and machine is working as hard and as long as they possibly can, the entire manufacturing plant will naturally produce as much as it is physically capable of producing. They believe that any form of idleness, which to them implies inefficiency, wastes both money and time and thus slows down their entire manufacturing process. Alex and his staff prioritize the individual efficiency of every worker and machine over anything else, believing that this methodology will produce the most profit for the least amount of investment. Alex and his staff are not alone in their belief in efficiency. Alex’s corporate managers require Alex’s manufacturing plant to record and report the efficiency of every department, every machine, and every worker—and they threaten punishment

when those efficiencies fall. Alex’s corporate managers’ shared belief suggests that this devotion to efficiency is widespread among business managers. However, Alex’s commitment to efficiency causes problems in the plant. To maintain their efficiency, when a worker or a machine does not have any immediate work to do (because they are waiting for someone else to finish building their piece of a product), they start doing nonessential work like building spare parts for potential projects in the future. However, because there are hundreds of workers and the plant struggles to stay organized, this creates mountains of spare parts and excess inventory that are rarely used. Although the workers and machines are technically efficient because they are always working and never idle, their “efficiency” creates mountains of waste, indicating that efficiency on its own is not a useful standard to uphold.

Jonah teaches Alex that because different stages of the manufacturing process work at different speeds, an optimized manufacturing system will naturally have workers and machines who are idle, suggesting that individual inefficiencies within a system does not mean the system is less optimized. In Alex’s plant, each stage of manufacturing a product is done by a different worker with a different machine, and those machines operate at different speeds. As Jonah explains through his Theory of Constraints, the manufacturing process cannot possibly move faster than the slowest machines (the bottlenecks) in the process operate, so some machines and workers find themselves idle as they wait for the slow machines to perform their task. However, forcing idle machines or laborers to maintain peak efficiency and do unnecessary work—as Alex and his staff do—only creates excess inventory, which may never be needed. Since excess inventory wastes money and materials, Alex realizes that prioritizing efficiency might not only be fruitless, but wasteful. As he looks at his efficient-looking but failing plant, he realizes that he can no longer “assume that making people work and making money are the same thing,” suggesting that just because his workers and machines are busy does not mean that the plant is optimized or profitable. Jonah counsels Alex that “a plant in which everyone is working all the time is very inefficient,” and that, contrary to common belief, some idleness is a good sign. The faster machines will have to be idle at times while they wait for the bottlenecks to do their work. Rather than forcing them to do unnecessary work and create wasteful excess inventory, Jonah advises that it is better to just let them be idle and take it as a sign that the whole process is running on schedule. Although idle machines and workers may seem inefficient in isolation, they do not actually indicate that the system is less optimized than it could be.

Once Alex learns to focus on optimizing the plant’s manufacturing process as a whole, the plant’s overall rate of production increases, demonstrating that optimizing an entire system is a better objective than increasing the efficiency of

each individual part of it. Ironically, Alex optimizes his plant by putting less stress on the efficiency of individual parts. With less excess inventory causing mess and disorganization in the plant, Alex discovers that they can produce finished, selling products at a faster and more consistent rate than ever before, even though some machines are occasionally idle. Furthermore, by creating less wasted excess inventory, Alex's plant can increase their throughput (sales profits) while keeping inventory and operating expenses lower, resulting in a greater overall profit and serving their ultimate goal of making money. Goldratt ultimately argues that managers should put their energy into streamlining their process as a whole, even when that means accepting idleness or apparent inefficiency.



THE COST OF CORPORATE SUCCESS

In *The Goal*, industrial plant manager Alex's struggle to keep his family together is interwoven with his discovery of newer, better processes for managing complex systems. Although only a subplot of the story's main arc, Alex's fraught personal life provides a revealing window into the cost of a high-powered corporate career path. Alex's corporate career exacts mental and relational tolls upon himself and his family, suggesting that the satisfaction and prestige of corporate success come with a significant cost to one's personal life.

Alex's management woes at the manufacturing plant become not only a workplace problem but an intense personal burden, suggesting that a corporate management career exacts a heavy toll on one's personal life and mental wellbeing. As the manager of a failing plant, Alex experiences near-constant stress. His regional director, Bill Peach, often threatens Alex's career and yells at him for operating a failing plant. Often, Alex cannot sleep because he is thinking about the problems at the plant. His work occupies his mind even when he goes home for the day, suggesting that one's daily life and health can become plagued by the constant pressures of the job. On top of his own personal stress, Alex feels the weight of responsibility for the hundreds of employees who work in his plant. Situated in the midst of a depressed industrial town, Alex knows that if the plant fails and his employees lose their jobs, most of them will have nowhere else to turn for employment. He recalls that when he was brought in as the manager to rescue the plant, the local papers heralded him as a hero. However, now that Bill Peach threatens to close the plant, Alex wonders if he will become the town villain—the man who shuttered one of the few remaining job-providers in the town. Alex's burden of responsibility adds to his own personal stress, suggesting that a career in corporate management comes with the increased pressure of hundreds or thousands of other people depending on oneself. As Alex struggles to find solutions to all of his managerial problems, he realizes that he no longer enjoys simple, everyday things, like a sunrise in the spring. He reflects,

"What makes me mad sometimes is that I'm always running so hard that [...] I don't have time to pay attention to all the daily miracles going on around me. Instead of letting my eyes drink in the dawn, I'm [...] worrying about Peach." Alex's frustration suggests that a corporate management career can cause so much preoccupation that one fails to slow down and appreciate life's simple pleasures.

Alex's corporate management career not only negatively impacts his own life, but his family members' lives as well, suggesting that another cost of a corporate career is the disruptive effect it may have on the health and wellbeing of one's family. Although Alex does not intentionally neglect his wife, Julie, he spends so much time dealing with workplace problems—which, to him, feel unavoidable—that he does not give her any time or attention. This causes Julie to feel unwanted and invisible to her husband, especially because Alex tends to prioritize salvaging his career over salvaging his relationship with her. Julie feels so neglected that she leaves Alex and the children for a time, and she considers divorcing him. Although Alex and Julie eventually work out their problems, this notably happens only when Alex begins to solve some of his management problems as well, which frees up more of his time. Alex's relationship with his children also suffers due to his commitment to his corporate career. When Alex is working a late night at the office, his second-grade daughter, Sharon, waits all evening next to the door, eager for him to come home so that she can show him her straight-A report card. She's crushed when Alex never appears. Often, Alex spends so little time at home that he doesn't see his children for days at a time, leaving his mother or Julie to take care of them on their own. Though he lives with his children, they lack a consistent father figure. Even when Alex does start to spend time with his kids—again, as he starts to solve some of his management problems—they only ever spend their time together brainstorming about how he can solve problems for the manufacturing plant. Not once does Alex spend any time just relaxing with them or asking them what *they* care about. Even in his family relationships, Alex's whole world remains oriented around his career. This unfortunately suggests that a corporate management career, with all its great demands, can easily detract from one's relationship with one's immediate family and can become the greater priority.

The novel never truly justifies Alex's corporate career or the heavy cost of it on his health and his family. Although he finds satisfaction in doing his job well, after Alex saves his plant and gets promoted to be the division manager, he admits to Julie that the promotion feels like "just winning a point in the rat race," suggesting that it all seems somewhat meaningless. Even so, Alex accepts the promotion and suddenly declares all of the struggle and emotional pain to be an "exciting, worthwhile journey" without ever naming what makes it worthwhile in the first place. Though *The Goal* is first and foremost a novel about

business management practices, Goldratt's inclusion of Alex's personal and familial struggles alludes to the cost that a corporate career can have on "any manager who is to some extent obsessed with his work," raising the question of whether such a career is worthwhile.



SYMBOLS

Symbols appear in **teal text** throughout the Summary and Analysis sections of this LitChart.



THE HIKERS

The hikers symbolize the manufacturing process at Alex's industrial plant. They illustrate how dependent events and statistical fluctuations can cause compounding delays in a system, and how those delays can be mitigated using a system's bottlenecks. As Alex hikes with his son Dave's Boy Scout troop, he notices that the single-file line of hikers struggles to stay together. The slower kids disrupt the pace of the faster kids, hikers stop and start, and each boy is limited by the pace of all the boys in front of him. Although everyone can maintain a reasonable average of two miles per hour individually, the fact that each child is limited by the speed of every hiker in front of him causes any delays within the line of hikers to accumulate and compound. This illustrates how, every time a minor delay occurs in the manufacturing process, that delay is carried through every subsequent stage of the system. Any time lost to delays is nearly impossible to recover, because each stage in the process can only move as fast as every stage in front of it, some of which are slow and some of which are fast.

When the fast hikers are positioned in the front and the slowest hikers in the back, every hiker is able to hike at their maximum speed. Although Alex at first thinks this might work well, he realizes that the group quickly stretches so far out that, in the back, there is half a mile between him and the boy at the front. His speed at the back remains as slow as the slowest hiker, Herbie, who represents the group's bottleneck. In terms of the manufacturing system, Alex realizes that the increasing distance between the fastest hiker and himself represents the plant's increasing inventory, which loses them money. Meanwhile, his own slow speed, constrained by Herbie, represents the plant's low throughput.

However, Alex realizes that by reversing the order and organizing the hikers from slowest to fastest, every hiker is able to match the speed of the hiker in front of him. Although the overall pace is slower than the fastest hikers, the group stays together, symbolizing the idea that inventory remains low when bottlenecks set the pace in manufacturing. Additionally, since there are no more starts and stops or delays as they regroup, Alex realizes that the group's average pace is higher than it was

before. This illustrates that, by organizing a system and pacing it according to its bottleneck, a manufacturing system can maintain a more consistent and overall higher output.




QUOTES

Note: all page numbers for the quotes below refer to the The North River Press edition of *The Goal: A Process of Ongoing Improvement* published in 1984.

Chapter 1 Quotes

●● So where was I last night, [Peach] asks, when he tried to call me at home? Under the circumstances, I can't tell him I have a personal life. I can't tell him that the first two times the phone rang, I let it ring because I was in the middle of a fight with my wife, which, oddly enough, was about how little attention I've been giving her. And the third time, I didn't answer it because we were making up.

Related Characters: Alex Rogo (speaker), Julie Rogo, Bill Peach

Related Themes: 

Page Number: 4

Explanation and Analysis

The story opens with a nasty confrontation between Alex, who owns a failing manufacturing plant, and his boss, Bill Peach. Peach is furious at Alex over a customer order that is months overdue and annoyed that he could not reach Alex the night before. Throughout the story, Alex struggles to give his wife, Julie, the attention that she needs; he most often prioritizes the demands of his corporate job over her emotional needs. However, Alex's sense that he can't tell Peach he needs to maintain his personal life indicates that the corporate environment expects that Alex will sacrifice his wellbeing and family relationships for the sake of business. Although Alex certainly appears more committed to his career than to his family throughout the novel, Peach's fury reveals that this is not just a flaw in Alex's character. Rather, Peach's implied demand that Alex be available to him at any hour of the day, even if Alex is spending time with his family, suggests that sacrificing one's personal and family life for the sake of their career is an inherent cost of corporate life and advancement.

Chapter 2 Quotes

☞ When I came back to manage this plant, the *Bearington Herald* did a story on me. I know, big deal. But I was kind of a minor celebrity for a while. The local boy had made it big. It was sort of a high-school fantasy come true. I hate to think that the next time my name is in the paper, the story might be about the plant closing. I'm starting to feel like a traitor to everybody.

Related Characters: Alex Rogo (speaker)

Related Themes: 

Page Number: 13-14



Explanation and Analysis

When Alex's plant is on the brink of closure only months after he's taken the management position, Alex worries that he is failing Bearington, which happens to be his hometown. The local paper heralds Alex as a hometown hero, a success story in a depressed town, suggesting that Alex bears the weight of the townspeople's expectations. Along with his sense of personal failure, fear of sending all of his employees into unemployment, and fear of losing his own livelihood, the townspeople's hope for Alex to succeed adds yet another burden onto his shoulders that raises the stakes of the plant's survival or failure. If Alex lets the plant fail, not only will they lose another employer, but they'll also lose a symbol that people from the small town of Bearington can make it in the corporate world. This added pressure demonstrates another cost of the corporate lifestyle on one's personal wellbeing and family. By adding more pressure and raising the stakes of failure, hometown expectations elevate Alex's stress and fear, which in turn results in sleeplessness, preoccupation, time away from family, and an unsustainable level of activity. Other people's hopes and expectations make Alex feel as if he is carrying an enormous burden.

Chapter 3 Quotes

☞ Halfway to the city, the sun rises. By then, I'm too busy thinking to notice it at first. I glance to the side and it's floating out there beyond the trees. What makes me mad sometimes is that I'm always running so hard that—like most other people, I guess—I don't have time to pay attention to all the daily miracles going on around me. Instead of letting my eyes drink in the dawn, I'm watching the road and worrying about Peach.

Related Characters: Alex Rogo (speaker), Bill Peach

Related Themes:  

Page Number: 21

Explanation and Analysis

While Alex makes an early morning drive to UniCo company headquarters for a division meeting, he reflects on how little time he has anymore. Alex's realization that he can never relax and enjoy the simple pleasures of life demonstrates yet another cost of the corporate lifestyle. Notably, however, Alex's mournful reflection suggests that he wishes he had more unstructured time to see and enjoy the world. This wish stands in stark contrast not only to Alex's current lifestyle but also to the novel's focus on goals and argument that every pursuit should have a goal, and every action one takes should service that goal. Alex's wish to be able to watch and appreciate the sunrise on a cold morning seems to be a direct reaction against a life that is otherwise ruthlessly goal- and progress-oriented, suggesting that some part of him wishes he did not submit himself to the constant demands of corporate life. Although the novel does not dwell on this wish for unstructured moments, it does allow for a brief recognition that the corporate lifestyle comes at a considerable, even questionable, cost to one's quality of life.

Chapter 5 Quotes

☞ "...consistent parameters...essential to gain...matrix of advantage...extensive pre-profit recovery...operational indices...provide tangential proof..."

I have no idea what's going on. Their words sound like a different language to me—not a foreign language, exactly, but a language I once knew and only vaguely now recall. The terms seem familiar to me, but now I'm not sure what they really mean. They're just words.

You're just playing a lot of games with numbers and words.

Related Characters: Alex Rogo (speaker), Eliyahu Goldratt, Jonah, Ethan Frost, Bill Peach

Related Themes:  

Page Number: 34

Explanation and Analysis



During their division performance meeting, Alex listens to Bill Peach and Ethan Frost talk about metrics and performance, but he thinks it all sounds like corporate jargon. Alex's epiphany that he recognizes all of these terms but doesn't actually know how they help him run his business suggests that nobody in their company truly

knows what they are doing. His sense that they are only “playing games” implies that corporate leaders use long words and impressive-sounding concepts to hide the fact that they don’t know how to solve their company’s problems. Additionally, Peach and Frost’s numerous, convoluted measurements demonstrate the need for simpler, clearer metrics that can actually help a business determine whether it is succeeding or failing. In sum, Alex’s sense suggests that traditional corporate culture strains to sound impressive and cohesive, which only masks the fact that no one has a clear picture of what they are doing or why. As a result, they are in need of a wise guiding figure such as Alex’s mentor, Jonah (who represents Goldratt in the story).

Chapter 6 Quotes

☞☞ Can I assume that making people work and making money are the same thing? We’ve tended to do that in the past. The basic rule has just been to keep everybody and everything out here working all the time; keep pushing that product out the door. And when there isn’t any work to do, make some. And when we can’t make them work, lay them off.

Related Characters: Alex Rogo (speaker)

Related Themes:  

Page Number: 43

Explanation and Analysis

After chastising a supervisor for leaving three of his workers idle, Alex begins to wonder whether keeping everyone busy actually helps the plant make more money. The fact that Alex raises this question at all shows an early benefit of having a clear goal: now that Alex has identified that the plant’s primary goal is to make money, it occurs to him that busyness is not the same thing as productivity. Alex’s question introduces the thematic conflict between individual efficiency (where every worker or machine operates at their full capacity) and optimization, where the entire manufacturing system works efficiently as a whole to produce products, even when the individual pieces of that system are not always working themselves. Corporate tradition holds that if every worker and machine is as efficient as possible, the entire system will be as productive as possible. However, Alex’s sudden doubts about this assumption represent his first major shift away from traditional corporate thinking.

Chapter 11 Quotes

☞☞ “Everything is for your job,” she says. “It’s all you think about. I can’t even count on you for dinner. And the kids are asking me why you’re like this—”

There is a tear forming in the corner of her eye. I reach to wipe it away, but she brushes my hand aside.

“No!” she says. Just go catch your plane to wherever it is you’re going.”

“Julie—”



She walks past me.

“Julie, this is not fair!” I yell at her.

She turns to me.

“That’s right. *You* are not being fair. To me or to your children.”

Related Characters: Alex Rogo , Julie Rogo (speaker), Jonah

Related Themes:  

Page Number: 81

Explanation and Analysis

When Alex decides to take an overnight flight to meet Jonah for breakfast in New York, the suddenness of the trip upsets Julie, and they fight about it. Alex’s shouted accusation that Julie is being unfair for being upset at him indicates that at this point, Alex does not understand what he is doing wrong by spending all his time and energy on his job. In his eyes, his job comes before his family. However, Julie’s charge that Alex is being unfair to her and their children implies that she believes Alex must put his family before his job. This fight reveals a fundamental disagreement between Alex and Julie about their priorities in life and how they should function as a married couple. Such a fundamental disagreement further suggests that Alex and Julie’s marriage, like Alex’s plant, suffers from a lack of clear, stated goals—a vision for what their life together should look like. Alex’s marital problems thus show how Jonah’s insistence that Alex keep a clear goal in mind not only pertains to his corporate management career, but to his personal life as well. The discord in Alex and Julie’s relationship indicates that without clear goals, things inevitably fall into disarray.

☞☞ “A plant in which everyone is working all the time is very inefficient.”

Related Characters: Jonah (speaker), Alex Rogo

Related Themes:   

Page Number: 84

Explanation and Analysis

Although Alex explains that he needs every person in his plant working constantly just to ship any orders at all, Jonah tells him that such a busy plant is actually inefficient, rather than efficient. Jonah breaks from the traditional corporate idea that a system in which every person or machine works at 100-percent capacity will naturally create the highest possible output. By breaking away from this idea, Jonah thus argues that the individual efficiency of each part of a system is not the same as the overall efficiency of a system. Rather, by viewing a system holistically and trying to increase the efficiency of its entire operation (or optimizing that system), one can make substantial changes. Jonah's approach to business moves away from focusing on the specific parts of a system—and the metrics that measure those specific parts in isolation—and approaches problems like optimization from a broader perspective. As Alex will later realize, this holistic approach reflects Jonah's philosophy of studying the relationships within a system and learning how those relationships affect the performance of the entire system.



they resemble his manufacturing system at the plant, with each individual hiker representing one stage of the system. The hikers work as the story's primary symbol to demonstrate how delays, or negative fluctuations, compound on one another in a complex system. Just as the hikers walk at different speeds, the various machines and workers in a manufacturing line will operate at different speeds, and those speeds will fluctuate up or down, especially when a human worker is involved.


Common sense suggests to Alex that those fluctuations should average out to a middle, sustainable speed, and thus his manufacturing system should be able to maintain a reasonable steady pace. However, Jonah already cautioned Alex that this is not the case. Just as with the hikers, any time that one stage of the process is delayed, it causes delays for every subsequent stage as well. Even if one stage were to fluctuate upward to maintain an average pace, it can only fluctuate as high as the slowest stage in front of it. Thus, rather than brief delays and statistical fluctuations averaging themselves out, they compound and accumulate within the system, dragging everything behind and off schedule. For Alex's plant in its current state, this means that every time a machine or worker has any delay at all, they lose time from their production schedule that cannot be regained.

Chapter 13 Quotes

☝☝ Our hike is a set of dependent events...in combination with statistical fluctuations. Each of us is fluctuating in speed, faster and slower. But the ability to go faster than average is restricted. It depends upon all the others ahead of me in line. So even if I could walk five miles per hour, I couldn't do it if the boy in front of me could only walk two miles per hour. And even if the kid directly in front of me could walk that fast, neither of us could do it unless all the boys in the line were moving at five miles per hour at the same time.

Related Characters: Alex Rogo (speaker), Jonah, Dave Rogo

Related Themes:  

Related Symbols: 

Page Number: 100

Explanation and Analysis

Alex goes with his son, Dave, on an overnight Boy Scout hiking trip. As the boys walk single-file, Alex realizes that

Chapter 18 Quotes

☝☝ “This much is clear to me. We have to change the way we think about production capacity. We cannot measure the capacity of a resource in isolation. Its true productive capacity depends upon where it is in the plant. And trying to level capacity with demand to minimize expenses has really screwed us up. We shouldn't be trying to do that at all.”

Related Characters: Alex Rogo (speaker), Jonah

Related Themes:    

Page Number: 138

Explanation and Analysis


Meeting with his staff, Alex realizes that the way that they've always measured efficiency and production capacity is meaningless, since it does not relate to the overall capacity of the system. Before Jonah began helping them reform their manufacturing process, Alex's plant measured efficiency with traditional corporate metrics, trying to calculate how much work each individual machine did compared to its maximum potential. However, Jonah's

encouragement to pace their manufacturing system according to its slowest constraints and allow the faster machines to sit idle at times, rather than create excess inventory, implies that the old metrics are no longer helpful.

Since Jonah's principles view the entire manufacturing system as a whole unit and maximizes its production capacity as a whole, measuring the individual efficiencies of each part of that system no longer provides useful data. Alex's claim that they must all change the way they think about production capacity reveals the extent to which Jonah's advice represents a fundamental shift in business philosophy. More than just modifying one or two practices, Alex's reflection implies that they must throw away many of their former notions and former metrics and reconsider everything they know about production. In sum, they must revolutionize their view of manufacturing systems.

“A bottleneck [...] is any resource whose capacity is equal to or less than the demand placed upon it. And a non-bottleneck is any resource whose capacity is greater than the demand placed upon it.”

Related Characters: Jonah (speaker), Eliyahu Goldratt, Alex Rogo

Related Themes: 

Page Number: 139

Explanation and Analysis

Jonah offers Alex's staff this definition of a bottleneck or constraint, which is fundamental to Jonah's (and thus, Goldratt's) Theory of Constraints. Whether a resource is a bottleneck (constraint) or a non-bottleneck (non-constraint) is the most important distinction for organizing one's system according to the Theory of Constraints and optimizing its output. Although Jonah elsewhere frames bottlenecks as the one or two slowest variables in a manufacturing system, which slow the pace of the rest of the system, this formal definition of a bottleneck refers to any machine, person, or stage that can operate at full capacity at all times without doing unnecessary work. This broadens the idea of a bottleneck to any resource which must maintain 100-percent efficiency and cannot have any idle time without slowing the entire system down. Notably, this definition allows for new resources to become bottlenecks if the initial bottlenecks' capacity is increased to the point that new resources are effectively maxed out as well.

Chapter 19 Quotes

“Alex, tell your children what's bothering you,” my mother says, “It affects them too.”

I look at the kids and realize my mother's right.

Related Characters: Alex Rogo, Alex's Mother (speaker), Sharon Rogo, Dave Rogo

Related Themes:  

Page Number: 149

Explanation and Analysis



While Alex is eating dinner with his mother and his children, after Julie has left him, his mother encourages him to share his workplace problems with them. Alex's mother's encouragement recognizes that although Alex is the corporate manager, his workplace struggles indirectly affect the rest of his family as well, since those problems often keep Alex away from home or so preoccupied that he becomes distant. Moreover, Alex's workplace issues are ultimately the source of his conflict with Julie which drove her away, leaving their children without a mother. For Alex, realizing that he should share his workplace troubles with his family rather than hide them away is an important step in learning to balance his corporate career with his commitments as a husband and father. Although Alex's instinct is to keep his problems in his own head and assume that his children wouldn't want to know about them, his mother's insistence that he talk about his problems suggests that he needs to share all parts of his life with them and recognize that they are affected by those problems just as he is. Particularly since Alex's job consumes the vast majority of his time, energy, and attention, he should at least allow his children to share in his life by sharing the challenges of his career with them.

Chapter 21 Quotes

“Look, I'm convinced you did the right thing back there. Aren't you?”

“Maybe I did the right thing,” [Bob] says, “but I had to break all the rules to do it.”

Related Characters: Bob Donovan, Alex Rogo (speaker), Jonah

Related Themes:  

Page Number: 176

Explanation and Analysis

After changing several long-held manufacturing processes to adjust to Jonah's new methods, Alex notices that Bob seems bothered by everything they are doing. As an experienced production manager, Bob is steeped in the traditional methods and metrics of manufacturing production. His statement that he feels as though he is breaking old rules, even if what they are doing works, suggests that breaking away from long-held traditions is uncomfortable and perhaps even frightening for someone like him. Although the new management principles that the novel outlines are certainly effective, Bob's unease suggests that for many people, especially those who've spent their whole career managing systems in one particular way, revolutionizing their approach to management or manufacturing will be a personal challenge. When one's career and professional identity rests on decades' worth of corporate tradition, disrupting that surety is bound to cause unease, at least until the new methods prove their own effectiveness over the traditional methods.

Chapter 23 Quotes

☝☝ "I'm going to have Bob Donovan put together an I.E. to write up [your new] procedures formally, so we can start using them round the clock. [...] You keep that mind of yours working. We need it."

Related Characters: Alex Rogo (speaker), Bob Donovan, Mike Haley

Related Themes:   

Page Number: 193

Explanation and Analysis

As Alex and his staff look for ways to increase the capacities of their two bottleneck machines, they discover that a foreman named Mike Haley has already devised and implemented a faster way to load one of them, resulting in a 10-percent increase in his shift's capacity. Alex's appreciation for Mike's innovation reflects how significant a 10-percent increase on a bottleneck machine is, since that will, in turn, raise their entire system's capacity by 10 percent. More significantly, however, the fact that a foreman devised a more efficient method for handling a bottleneck machine suggests that even low-level employees can bring important innovations to reforming a complex system. In fact, people like Mike Haley are better positioned to understand how such bottleneck systems work than Alex

or his management staff could ever be—individuals like Mike work with those bottleneck resources day in and day out and thus have a much more thorough knowledge of what increases capacity or decreases it. This suggests that such people are invaluable to improving a complex system, even though they may not be in high-level management roles.

Chapter 25 Quotes

☝☝ "But what are we supposed to do?" asks Bob. "If we don't keep our people working, we'll have idle time, and idle time will lower our efficiencies."

"So *what?*" asks Jonah. [...] "Take a look at the monster you've made. It did not create itself. You have created this mountain of inventory with your own decisions. And why? Because of the wrong assumption that you must make the workers produce 100 percent of the time, or else get rid of them to 'save' money."

Related Characters: Jonah, Bob Donovan (speaker)

Related Themes:    

Page Number: 210

Explanation and Analysis

When Jonah explains that making a non-bottleneck always work does not increase productivity but rather decreases it by building up wasteful excess inventory, Bob struggles to let go of the idea that everyone must be busy and working all of the time. This is in part because it will hurt their individual efficiencies metrics, which they report to corporate headquarters. The conflict between Jonah and Bob demonstrates the difficulty of persuading corporate professionals to give up their traditional practices and accept a counterintuitive, though effective, solution. Even though Bob can clearly see that their excess inventory is out of control, he struggles to accept that encouraging individual productivity may actually be harmful. His worry that Jonah's approach will negatively impact their efficiency reports also suggests that corporate leadership's expectations, which fall in line with traditional corporate methods, can discourage people from adopting or accepting new and better ideas. If accepting new theories of business management like Jonah's will upset one's boss's expectations, they will struggle that much more to adopt new practices or break with tradition.

Chapter 26 Quotes

☞ “I’m working.” I tell her.

“Can I help?” [Sharon] asks.

“Well...I don’t know,” I say. “It’s kind of technical. I think you’ll probably be bored by it.”



“Oh,” she says. “does that mean you want me to leave?”

Guilt strikes.

“No, not if you want to stay,” I tell her. “Do you want to try to solve a problem?”

“Okay,” she says, brightening.

Related Characters: Sharon Rogo, Alex Rogo (speaker), Julie Rogo

Related Themes:  

Page Number: 213

Explanation and Analysis

While Alex is thinking about a problem with the plant at the dinner table one evening, Sharon asks if she can join him. Alex’s assumption that Sharon will be bored by whatever he is working on implies that Alex believes his work and family life should remain separate, even though his work consumes the majority of his time and energy. Furthermore, Alex assumes that Sharon will want to be entertained rather than to simply spend time with her father.

However, Sharon’s interest in helping Alex on a potentially boring problem suggests that only wants quality time with him. Her “brightening” implies that, as his daughter, she naturally desires attention from him, much like Alex’s wife, Julie, does. This interaction helps Alex to realize that he does not need to keep his family completely separated from his work—they want to engage with what he is working on, and they can even offer helpful insight. Although Alex never stops working long hours or dedicating himself primarily to his work, learning how to share his work life with his family at least allows him to be present in their lives, rather than absent as he’d previously been.

☞ “If we don’t go ahead with a system to withhold inventory and release it according to the bottlenecks, we’ll be missing a major opportunity to improve performance and save the plant. And I’m not about to stand by and let that happen just to maintain a standard that obviously has more impact on middle management politics than it does on the bottom line. I say we go ahead with this. And if efficiencies drop, let them.”

Related Characters: Alex Rogo (speaker), Bob Donovan

Related Themes:    

Page Number: 219

Explanation and Analysis

While Alex and his staff discuss a new method of releasing inventory at exactly the rate the bottlenecks can process it, Bob worries that they will have idle workers and machines—even though the overall system will work faster—which will lower their efficiencies and upset corporate headquarters. Alex’s bold speech advocates for taking progressive action, even when it involves uncertainty. The conflict Alex and his staff feel between traditional corporate practices and innovative new solutions suggests that reforming and revolutionizing any business system involves risk, both from the possibility of failure and the possibility of punishment from their superiors. However, Alex’s observation that the traditional metrics have “more impact on middle management politics than it does on the bottom line” implies that many traditional corporate policies are not used because they are effective and profitable, but rather because they are preferred by the people with the most power. If this is true, then people like Alex and his staff will only be able to reform and improve their system by defying their superiors long enough to prove that new ideas can work.

Chapter 28 Quotes

☞ “It’s perfectly okay to have more setups on non-bottlenecks, because all we’re doing is cutting into time the machines would spend being idle. Saving setups at a non-bottleneck doesn’t make the system one bit more productive.”

Related Characters: Alex Rogo (speaker), Bob Donovan, Jonah

Related Themes:   

Page Number: 233

Explanation and Analysis

When Jonah suggests that Alex can increase his plant’s manufacturing speed by cutting batch sizes in half as they move through each machine, Bob worries that they’ll have to do setup operations at each machine twice as often. However, Alex points out that losing a little time on a non-bottleneck machine is fine, since those machines have extra idle time to burn. Although Alex once worried about



allowing his machines to stand idle, his observation that they can afford to extra setup time demonstrates a hidden benefit of organizing a system according to its bottlenecks and allowing idleness: added flexibility.

Within the system under which Alex used to run his plant, with every machine and every worker operating as much as possible, introducing any new measures that required additional time or resources would have thrown off the system's tenuous balance and created even more delays. However, with idle time to burn on the non-bottleneck resources, Alex and his staff have far more leeway to experiment and innovate, since the system is flexible enough to absorb some variation. This flexibility and freedom to experiment is an undeniable benefit and will likely lead to further improvements.

Chapter 30 Quotes

☞ Living and breathing within range of my sight are 30,000 people who have no idea that one small but important part of the town's economic future will be decided tomorrow. Most of them haven't the slightest interest in the plant or what we've done here—except if UniWare closes us, they'll be mad and scared. And if we stay open? Nobody will care. Nobody will even know what we went through.

Related Characters: Alex Rogo (speaker)

Related Themes:  

Page Number: 254

Explanation and Analysis

As Alex drives through Bearington, he thinks about his imminent performance review that will decide whether the plant remains open or closes. Alex's reflection that his work at the plant plays a significant role in Bearington's residents' lives reframes his struggle to make the plant profitable, reminding the reader that there is more at stake than just money or Alex's corporate career. Alex's reflection suggests that corporate managers feel an inherent burden of responsibility not only for the people in their plant, but for all of the community in which they do their business. Since Alex's plant represents a significant portion of the local economy, his success or failure as a manager will not only affect him, but the lives of everyone in Bearington, particularly if the plant closes and the town becomes more economically vulnerable. Despite this great social responsibility, Alex's knowledge that nobody will know what he struggled for if the plant simply stays open suggests that, regardless of the prestige and good pay, such a corporate


management position can be a thankless role.

Chapter 31 Quotes

☞ I start to speak, but Hilton Smyth raises his voice and talks over me.

"The fact of the matter is that your cost-of-products measurements increased," says Hilton. "And when costs go up, profits have to go down. It's that simple. And that's the basis of what I'll be putting into my report to Bill Peach."

Related Characters: Hilton Smyth (speaker), Bill Peach, Alex Rogo

Related Themes:  



Page Number: 260

Explanation and Analysis

When Hilton Smyth conducts Alex's performance review, Alex explains his new methods and all the new profits that his plant has generated. However, Smyth fixates on Alex's cost-of-products measurement, which has gone up, and he insists that Alex's plant must be failing as a result. Hilton Smyth is the story's antagonist and represents strict adherence to traditional methods and metrics, as opposed to Alex, who looks for innovative and effective new solutions. Ironically, although corporate metrics are meant to reveal the truth about a business's viability, Smyth's devotion to the cost-of-products measurement—which Alex and his staff agree is antiquated and useless—effectively blinds him from being able to recognize the stunning success that Alex's plant has experienced. Smyth's conduct suggests that far from revealing the truth, outdated corporate metrics may actually prevent one from seeing something that is obviously true, such as the fact that Alex's plant is more profitable now than it has ever been.

☞ "Hilton, this morning I asked you to sit in for me because we were meeting with Granby. Two months from now the three of us are moving up the ladder, to head the group. Granby left it to us to decide who will be the next manager of the division. I think that the three of us have decided. Congratulations Alex; you will be the one to replace me."

Related Characters: Bill Peach (speaker), J. Bart Granby III, Eliyahu Goldratt, Johnny Jons, Ethan Frost, Alex Rogo, Hilton Smyth

Related Themes:  

Page Number: 262

Explanation and Analysis

Although Hilton Smyth recommends that Alex be removed from management and his plant be closed, Bill Peach reveals that he, Ethan Frost, and Johnny Jons have already decided to keep Alex's plant open and promote him, over Smyth, to division manager. The adulation and promotion that Alex receives, along with the news that his plant can remain open, resolves the primary tension of the story. His victory over Smyth not only represents the victory of the protagonist over the antagonist but also symbolizes the superiority of Goldratt's new ideas for managing systems over the old, traditionally-held methods. Hilton Smyth represents a strict adherence to tradition—his initial promotion over Alex but failure to run a profitable plant symbolizes how abiding by the status quo may initially please one's superiors but will ultimately fail when it becomes clear that those traditional methods cannot turn a profit.

Alex, representing new methods and innovation, initially finds himself in trouble until he has the chance to prove that the new methods work. Alex's success suggests that although one may meet with resistance when trying to introduce new ideas and break new ground, the risks and pain will ultimately be worthwhile when those new ideas prove far more fruitful than traditional methods.

As Alex celebrates his new promotion with Julie, he thinks back on the dire circumstances he was in only three months ago. The rapid transformation that Alex experiences in his life due to Jonah's (and thus, Goldratt's) principles suggests that following Goldratt's Theory of Constraints can transform one's business, career, and even personal life. Again, Alex acknowledges the pressure of being responsible for 600 livelihoods, testifying to the tremendous burden of responsibility that comes with corporate management.

Revealingly, however, Alex implies that his greatest fear is turning from a "rising star" to an "ordinary bum," which suggests that his own ego and fear of being insignificant, just like any other person, plays a key role in motivating his corporate career. Although Alex does appear to feel responsible for protecting his employee's jobs, he appears just as concerned with protecting his own self-image as a successful career man. Although Alex mends his relationship with his family and saves his plant, his own need to be a "rising star" rather than an "ordinary bum"—even when it puts incredible strain on his wife and children—implies that he is fundamentally selfish, driven by his own ego.

“[Jonah's] solutions look trivial, but the fact is that for years we've done the exact opposite. Moreover, the other plants insist on sticking to the old, devastating ways. Probably Mark Twain was right saying that 'common sense is not common at all' or something similar.”

Chapter 32 Quotes

“A chill goes down my back as I remember it. I was in deep trouble. My plant was under a real threat of being closed down; over 600 people were about to join the already long unemployment lines; my career was one inch from being kissed by limbo; and on top of all that, the unbelievable hours I was putting in at work had pushed our marriage to the brink of going down the tube. In short, I was about to change from a bright, rising star to an ordinary bum.”

Related Characters: Alex Rogo (speaker), Eliyahu Goldratt, Jonah, Julie Rogo

Related Themes: 

Page Number: 265

Explanation and Analysis

Related Characters: Alex Rogo (speaker), Eliyahu Goldratt, Julie Rogo, Jonah

Page Number: 267

Explanation and Analysis

Julie asks Alex why he and his staff couldn't reach Jonah's conclusions without his guiding questions, since each of his ideas seem simple and obvious enough. Alex's sense that he, his staff, and all the other plants are trapped in the "old, devastating ways" again suggests that tradition and common practice are powerful motivators and keep businesspeople loyal to antiquated methods and ideas. However, the fact that Jonah's ideas are simple, mere "common sense," implies that anyone can innovate and revolutionize business systems and management practice if they are willing to challenge the status quo. If new thinkers and leaders seriously question long-held assumptions and standards, there is no reason that they cannot continue to innovate and build on Goldratt's work. They must only be brave enough to challenge their contemporaries and re-

examine their own underlying beliefs.



Chapter 36 Quotes

“Everywhere, improvement was interpreted as almost synonymous to cost savings. People are concentrating on reducing operating expenses as if it’s the most important measurement.”

“Not even that,” Bob interrupts. “We were busy reducing costs that didn’t have any impact on reducing operating expenses.”

“Correct,” Lou continues. “But the important thing is that we, in our plant, have switched to regard throughput as the most important measurement. Improvement for us is not so much to reduce costs but to increase throughput.”

Related Characters: Bob Donovan, Lou (speaker), Eliyahu Goldratt, Alex Rogo

Related Themes:  

Page Number: 297-298

Explanation and Analysis

Alex and his staff discuss the improvements they’ve made at the plant and try to figure out how they can keep building on those improvements. Lou’s comment suggests that, by traditional corporate wisdom, cutting costs will inevitably result in increased net profit and is thus how most people try to improve their business. While this notion seems obviously flawed by the end of the novel, it demonstrates the importance of having a clear goal in mind. Since Alex established that their primary goal is to make money, he and his staff centered their efforts around increasing their throughput rather than reducing their operating expense. Without this clear goal in mind, it seems just as likely that they would have focused on mitigating operating expenses like everyone else, even if those reduced expenses don’t substantially increase throughput. Through Lou’s summarizing comment and Alex’s efforts throughout the story, Goldratt argues not only for clearly-defined goals, but also for moving from a cost-focused view of business to a profit-focused view, which better supports any business’s primary goal of making money.

Chapter 38 Quotes

“Things start to be connected to each other. Things that we never thought were related start to be strongly connected to each other. One single common cause is the reason for a very large spectrum of different effects. You know Julie, it’s like order is built out of chaos. What can be more beautiful than that?”

Related Characters: Alex Rogo (speaker), Eliyahu Goldratt, Hilton Smyth, Jonah, Julie Rogo

Related Themes:   

Page Number: 318

Explanation and Analysis

As Alex and Julie sit together and discuss what they’ve each been learning, Alex explains that he realizes that Jonah approaches business like a scientist, searching for hidden relationships between phenomena rather than just gathering data. Jonah’s scientific approach to business reflects Goldratt’s own self-proclaimed scientific approach. Notably, such an approach differs from traditional management, where one balances the demands of one’s superiors and the needs of their employees, all while gathering data and reporting their own progress to make themselves look favorable, like Hilton Smyth does.

Rather, approaching business management like a scientist implies that one honestly seeks to study and understand the complex processes and how each variable relates to each other variable. As a scientist, a manager can build their understanding of their business system from the ground up, rather than lean on traditional corporate wisdom and metrics that may or may not provide an accurate picture of what is truly happening. Alex’s sense that a scientific approach can build order out of chaos evokes what a manager should ideally be able to do: govern and organize a complex system to produce a desired outcome. This is far different than Alex’s management strategy in the beginning of the story, which primarily involved managing crises and mitigating disasters as they appeared. This shift in management philosophy not only presents a new ideal for what a manager should be, but also represents a significant growth in Alex’s own demonstrated capacity.



SUMMARY AND ANALYSIS

The color-coded icons under each analysis entry make it easy to track where the themes occur most prominently throughout the work. Each icon corresponds to one of the themes explained in the Themes section of this LitChart.

CHAPTER 1

Alex Rogo drives into the parking lot of the manufacturing plant he manages. He immediately sees that Bill Peach, their division's vice-president, is parked in Alex's parking spot as if to reinforce his authority. When Alex enters the plant, four different people approach him at once, all yelling about how Peach walked into the plant an hour ago, demanding to know where order 41427 is. Like every other order in the plant, 41427 is weeks behind schedule. All of its component parts are finished and ready for assembly except for one small piece that hasn't been made yet, which means that the entire product can't be put together.

Alex's staff tells him that when Peach found out a piece of order 41427 was missing, he demanded that one machinist cancel what he was working on and reset their machines to build the final part, even though it will cost them several hours of time to reset. The machinist is furious about this, but Alex tells him to follow Peach's orders. Alex finds Peach in his office, sitting behind Alex's desk. Peach angrily tells him that the client, Bucky Burnside, spent an hour shouting at him about his overdue order last night. Peach is angry that Alex doesn't seem able to manage his own plant, and they keep losing money. He tells Alex that Alex has three months to turn the plant around, or Peach will close it for good. Peach needs Burnside's order shipped by tonight.

Peach leaves and Alex tells his secretary, Fran, that he'll be out on the factory floor awhile. He surveys the vast open space, acres of machinery and raw material, and he marvels at the complexity of it. Alex sees Bob Donovan, his production manager, approaching him. Bob tells Alex they have a problem with order 41427: the "master machinist" that Peach yelled at just quit, but not before damaging his machine, the NCX-10. Now the plant is short one hard-to-replace technician and an essential machine.

The pressure that Bill Peach exerts on the plant, and the fact that every order is behind schedule, indicate that Alex's plant is struggling to get by. This establishes the difficulty of trying to manage without clear goals, and it positions Alex for his journey to become a better manager. Peach parking in Alex's parking spot is an obvious show of power, indicating that corporate life involves interpersonal posturing.



The disruption and anger that Peach causes in the plant demonstrates how easily a manufacturing process can be derailed and delayed. Peach's three-month ultimatum for Alex to turn the plant around sets high stakes for Alex's growth as a manager and forces him to quickly implement any changes he must make. This narrow window of time not only establishes a quick pace for the story, but it also allows Goldratt to show that his ideas, if implemented properly, can rapidly improve the performance of any system.



Alex's wonder at the complexity of his plant suggests that he enjoys the meticulous nature of keeping such an operation running. However, the machinist's decision to quit because of Peach's angry insistence demonstrates the consequences of bad management, particularly since the loss creates a significant expense for Alex's plant.



CHAPTER 2

At home, Alex's wife, Julie, is dressed up and has her hair done—she wants to go out with Alex for the evening. Alex tells her that he can't because he's in the middle of a work crisis, which makes Julie grouchy. However, when Alex explains that the plant might close in a few months, Julie brightens, since this means they could move out of Bearington. Alex knows that Julie hates the town, which Alex grew up in, but he feels sentimental toward it. He can understand her dislike, however—Bearington is a depressed factory town with little else in it. When Alex took over the plant a few months ago, the local paper celebrated him as a hero, the successful local boy who would save one of the few remaining employers in the area. If the plant closes, Alex feels like he will have betrayed the town's trust.

After eating a quick dinner, Alex goes back to the plant. Donovan meets him and explains that they fixed the NCX-10, but not until early evening. For the rest of the night, everyone in the department focuses on Burnside's order—they ship it just before midnight. Afterward, Alex takes Donovan out for burgers and beer at a local diner, where they drink to having finished the order so quickly. Donovan is proud of his people for their work, but Alex is wary. He knows they can't operate like that all the time—it's not cost-effective. Something needs to change.

Later, Alex reflects on the day. He feels like there is nothing at all to celebrate—his plant shipped one overdue order, that's all. He envisions what will happen in three months if he can't turn the plant around: Peach will go to Granby, UniCo's CEO, with the numbers on their plant. Granby will look through them and decide to shut the plant down, and UniCo will lose one more market. All 600 people who work in the plant will have to join the unemployment lines with everyone else in town.

Alex can't even understand what he's doing wrong. He has good employees and they work hard and fast. On paper, they should be successful. Alex has college degrees in engineering and in business, but the factory can never ship any orders on time, and they consistently lose money. All the years that Alex has worked and all the hours he hasn't spent with his family, just to move up the corporate ladder in UniCo, seem like they're about to be wasted.

Julie's character explores the cost of a corporate career on one's personal life and family. The irritation she feels toward Alex for not going out with her foreshadows their growing marital problems and her overall feeling of neglect. Notably, Alex's career keeps him from spending time with his wife and requires them to live in a town that Julie hates and that Alex knows holds nothing for her. This indicates that Alex places his career before his wife and family in almost every way. Additionally, Alex's fear of disappointing the town suggests that he also feels the weight of responsibility for keeping everyone in the plant employed.



Alex's plant manages to ship Burnside's order in time, but only barely, and Alex recognizes that their methods are unsustainable. This suggests that a manufacturing plant or business system like his can just barely function and survive by traditional methods. Alex's sense that they can't operate this way forever suggests that those standard practices are ineffective in the long term.



Alex's vision of his 600 employees standing in the unemployment lines suggests that he feels burdened with the responsibility of protecting their livelihoods. This adds to the stakes of Alex's job—making it more significant than just something that keeps him away from his family—while also suggesting that management positions are difficult roles to shoulder.



Alex's confusion at why his plant fails if they look good on paper alludes to the fact that their traditional corporate metrics are deeply flawed. Additionally, the fact that the laborers work hard and fast but fail to produce implies that though the plant is busy, it is not using its labor effectively.



CHAPTER 3

Early in the morning, Alex drives into headquarters, where Peach has called an emergency meeting with all the other plant managers in his division, presumably to announce how badly they are doing. The spring morning looks beautiful, and Alex thinks about how little he pays attention to the world around him anymore. Instead, he worries about Peach. He thinks about how different Peach used to be, so much more confident and relaxed than he is now. He and Alex even used to be friends. Now, Peach seems manic, constantly at his wit's end. These days, he and Alex mostly scream at each other.

As Alex walks in from the parking garage, he runs into one of Peach's staff members. The staff member shares a rumor with Alex that Granby is considering closing Peach's entire division. If that happens, Peach will lose his job, as will every single person in the division. Alex realizes that this must be why Peach has been acting so stressed—they're all at risk of being unemployed within months. Alex enters the meeting and sits with the other managers, including Hilton Smyth, whom Alex dislikes and who glares at Alex as he sits down. Peach and his division controller (accountant) Ethan Frost are making a presentation on the division's poor performance. Alex reaches in his jacket for a pen to take notes but instead finds a cigar. He thinks back to the day he received it.

CHAPTER 4

Two weeks earlier, when Alex felt like things were still operating smoothly, he ran into Jonah, an old Israeli physics teacher of his, in an airport. Alex fills Jonah in on his role as the plant manager and explains that they've recently started using robots, which everyone agrees will take their company into the future. Jonah listens with interest and asks if the robots make the plant more productive. Alex exclaims that the new robots increased his plant's efficiency in one area by 36 percent, but when Jonah asks if they are making 36 percent more money, Alex admits that they're not.

Alex insists that a more efficient plant costs less money and thus makes a greater net profit. However, Jonah asks if his number of employees or amount of excess inventory has decreased, and Alex admits it hasn't. Jonah suggests, then, that the plant is not any better off with robots than without. Alex feels ill as he thinks about what Jonah says. When Alex adds that the robots have an efficiency rating over 90 percent, Jonah surmises that they must run all day and all night, and that Alex's inventory must be skyrocketing. Alex again admits that Jonah is right and wonders how he could know all these details about the plant.

Alex's sense that he doesn't appreciate the world around him suggests that the stress of his corporate career stops him from enjoying life's simple pleasures, demonstrating yet another cost of a corporate career. Furthermore, the fact that he and Bill Peach used to be friends but now hate each other suggests that corporate life can ruin good relationships and change people for the worse.



The possible threat of the entire division closing explains Peach's unhinged and irate behavior, suggesting that stress from a difficult corporate career can significantly alter one's personality. Granby's consideration of closing the entire division threatens the livelihoods of thousands of people, demonstrating the outsized role that large corporations have on the lives of everyday people.



Jonah represents Goldratt himself and directly voices Goldratt's opinions and theories throughout the novel. Aside from also being an Israeli business theorist, Jonah's role as a former physics teacher reflects Goldratt's scientific approach to management and business systems. Meanwhile, Jonah's intuition that supposedly-efficient robots have not made the plant any more money foreshadows his argument that efficiency is not the same thing as optimization.



Jonah's insight into Alex's plant's problems, such as high inventory, suggests that he has a deep understanding of manufacturing systems and the problems that can plague them. By contrast, Alex's belief that they are making more money despite having the same number of employees indicates that he has misguided notions of what practices will lead to success.



Jonah explains that he studies manufacturing organizations now, and that many plants have the exact same problems as Alex's. However, he is late for his flight and must be going. As Alex walks with Jonah to his gate, Jonah explains that although Alex believes he is running an efficient plant, it must be an inefficient plant judging by what he's described. Although Alex's measurements tell him that the plant is running well, he is using the wrong sorts of measurements. Alex insists that they are the same measurements that everyone else uses.

As they reach the gate, Jonah hands Alex a cigar and challenges him to question whether his plant is productive and whether it accomplishes a goal. Alex responds that of course it accomplishes a goal, since they make things, but Jonah argues that this is not the plant's actual goal—nor is it necessarily productive to simply make something. Before boarding his flight, Jonah tells Alex that he must figure out the primary goal of his manufacturing plant; without a clear goal, it is impossible to be truly productive.

CHAPTER 5

In Peach's meeting, Alex sniffs the cigar and wonders if Jonah isn't right: perhaps nobody in that room actually knows what they are doing. Peach and Frost are showing complex charts and using big words, and Hilton Smyth enthusiastically applauds anything Peach says, but Alex senses that it's all meaningless chatter. He needs to leave, to get some time alone and think about what productivity actually means. When the meeting adjourns for a short break, Alex slips out and leaves the building, though not before Smyth spots him leaving. Alex doesn't mind. If Peach fires him for leaving the meeting, it won't be much different than losing his job in three months anyway.

Alex drives back toward the plant but decides not to return to the office just yet. Instead, he buys some pizza and beer and drives up an adjacent hill overlooking the plant so that he can spend a few hours alone, eating and thinking. He thinks of what possible goals could be: buying materials, providing jobs, making quality products, keeping costs down, investing in new technology. None of those ideas seem right.

Alex looks at their warehouses of unsold merchandise and thinks that perhaps sales are their primary goal. However, making sales only matter if the company makes money, so Alex decides that the primary goal of his manufacturing plant is to make money for UniCo. Everything else only supports that goal. Alex decides that any action that helps the company make money is a productive action, and any action that doesn't is counterproductive. With this insight, he feels newly awakened. He finishes his beer and decides to go back to work.

Jonah's recognition that most plants have the same problems as Alex's indicates that Alex's plant is not unique—it represents every manufacturing plant run by traditional corporate standards. His suggestion that Alex's plant is actually inefficient when it seems efficient indicates that much of Jonah's insight will be counterintuitive.



Jonah's insistence that Alex must figure out his primary goal alludes to the importance of having clear goals in any endeavor. However, Alex's inability to state a clear goal suggests that the proper goal for one's endeavor may also be counterintuitive, even if it is uncomplicated. Alex's lack of a clear goal for his manufacturing plant explains why he struggles to manage it well or lead it toward success.



Alex's sense that even his corporate superiors do not know what they are doing suggests that poor goals and erroneous beliefs about business practice are widespread throughout corporate America. This indicates that Goldratt is trying to reform corporate culture and beliefs about productivity on a broad scale. Meanwhile, Smyth's enthusiastic applause for Peach's words indicates that he is vying for favor by sucking up to his boss.



Alex's need to simply be alone and think about what Jonah said implies that as a manager, he finds very little time to be alone and reflect. Notably, all of Alex's proposed goals involve single tasks within the greater manufacturing system, suggesting that he gets preoccupied with minor details rather than the big picture.



Although making money is a very simple, even obvious goal, it takes Alex several hours of thinking to realize it. This again suggests that proper goals are often counterintuitive, especially when a manager becomes preoccupied with minor functions as Alex does. Alex's realization that he can measure any action's productivity directly by his goal demonstrates the utility of clear and proper goals.



CHAPTER 6

Alex enters the plant at 4:30 p.m. On his way in, he notices three laborers sitting and reading a newspaper. As soon as they notice him, they scatter and look busy while Alex chastises their supervisor; with the strain that the plant is under, they can't afford idle workers. However, as Alex watches the men do unnecessary work to keep busy, he realizes he shouldn't assume that being busy is the same thing as making money. He looks at the manufacturing floor: nearly everyone and everything is moving, since that is what Alex has always demanded. Now, he wonders how much of that work is productive and profitable, and how much is just busyness for its own sake. He wonders if all the measurements his controller, Lou, uses to check the plant's efficiency really only measure how busy they keep the employees.

Alex enters his office after most of the day-shift workers have already left. His answering machines is full of messages from Bill Peach, but when Alex tries to call him back, no one answers. Lou enters Alex's office to let him know that he's sending Peach all of their accounting numbers. Alex asks Lou what the most fundamental metrics are to determine if a business is making money. They brainstorm together and establish that a business needs to know if it makes more sales than its investments cost (net profit), how much return on its investment (ROI) it's creating, and whether or not it has a sustainable cash flow—without cash flow, a business will die.

Lou asks Alex if the plant is about to be closed, and Alex admits that it is. However, Alex wants to fight to turn things around and try to save it. Lou promises he'll try to help, but he thinks that Alex is wasting his time with new metrics; he should stick to standard business practices. Alex hears Lou out and listens to his opinions on why the plant is failing, but he knows that all of Lou's grievances are just the typical excuses anyone comes up with. He knows Lou is a smart man and wonders how all these intelligent people could be so wrong about how to run a business.

Late in the evening, after Lou goes home, Alex sits with a pad of paper and a pencil. He writes out "net profit, ROI, and cash flow," and stares at them, wondering if one can be prioritized over the others. After several minutes, Alex decides that a business's goal is to make money by increasing net profit, while also increasing ROI and cash flow—all three are equally important. Alex feels as if he's closing in on a solution, but as he stares out at his plant, he can't figure out how to directly connect the plant's various operations with the three metrics. All he can think of are the old corporate metrics that he knows over-complicate things rather than tell him anything useful.

Alex's sense that busyness is not the same thing as productivity foreshadows Jonah's eventual advice that idle workers and idle machines are not necessarily bad. The disconnect between busyness and productivity also foreshadows the thematic conflict between individual efficiency and optimization of the entire production system. Alex's fear that Lou's metrics only measure busyness and not productivity foreshadows the novel's argument that businesspeople need to search for better, more precise metrics to determine the health of their business.



Alex and Lou's essential measurements all relate directly to their primary goal of making money, demonstrating how having a clear goal can help one determine which metrics are essential and which are inessential. This allows Alex to think about his plant and its ability to make money in simpler, clearer terms, rather than getting distracted by all the other nonessential metrics. Thus, clear goals can provide clearer focus.



Although Lou is an intelligent and experienced controller, his belief that the traditional, long-held metrics are best suggests that most people are naturally resistant to new ideas. However, Alex's awareness that all of Lou's traditional answers won't solve anything suggests that traditional corporate practices will ultimately not help a business to succeed.



Alex's desire for a simple way to measure the plant's performance suggests that over-complicated traditional metrics only conceal what is actually going on, rather than revealing a business's true weaknesses. Although Alex's three metrics are different than the three Jonah proposes, they still attempt to measure the way that money flows into and out of the business, thus relating to the overarching goal of making money.



Alex realizes it's after 10 p.m. and calls Julie, telling her he'll be home in an hour. Julie is irritated at him for not calling earlier and tells him that their daughter has a surprise for him—she waited by the window for him to come home all night, but he never showed up. After hanging up with Julie, Alex finds a shift supervisor and asks the man how the plant's ROI has improved in the last hour based on the work his employees are doing. The supervisor stares at Alex blankly, and Alex realizes that he doesn't know how to connect the daily operations of the plant with any loftier ideas about business management or making money.

Because Alex spends all his time at work, he disappoints his wife by not communicating with her and his daughter by never coming home to her, suggesting that his commitment to his corporate career inhibits his ability to be a father and a husband. Meanwhile, his employee's complete ignorance of concepts like ROI demonstrates the challenge of connecting business theory with day-to-day management.



CHAPTER 7

Alex gets home and finds dinner waiting for him in the microwave. His second-grade daughter, Sharon, appears, holding her straight-A report card that she's been waiting all night to show him. Alex listens to Sharon tell him about her day and her good grades, and then he puts her to bed a little after midnight. Even then, Alex can't sleep. He thinks about everything he needs to re-learn about running an organization if he's going to keep the plant in business. However, he has very little time. He decides he'll track down Jonah and ask him for help.

Sharon's decision to wait up all night to show Alex her report card implies that she is proud of her hard work and wants to share that accomplishment with her father. Alex's failure to give Sharon the attention and affirmation she needs reinforces how his corporate career negatively impacts not just himself, but his family as well.



CHAPTER 8

The next day, Alex wonders how to get in touch with Jonah if he doesn't even know where to find him. He goes to the plant and spends most of his day in a conference call discussing numbers and measurements with Peach (who is furious that Alex walked out on his meeting), Lou, and Ethan Frost. After dark, Alex is about to go home when he remembers his old address book at his mother's house. He calls Julie to tell her he won't be home until late, and Julie hangs up on him.

Once again, Alex spends more time away from his family for the sake of his work, indicating that he prioritizes his career over his wife and children. Julie hanging up on him suggests that her patience with him and his constant absence is wearing thin, foreshadowing a potential marital crisis.



Alex drives to his mother's house, which is right in town. He used to visit her and his brother, Danny, more often, but Julie doesn't like to, so they stopped. Alex's mother is surprised to see him and insists that he stay and eat. After several hours of chatting, eating, and searching through the attic and the basement, Alex finds the address book in a drawer of his childhood bedroom, which has the number of an old university friend who lives in Israel. Although it's one a.m., Alex knows it will be midday in Israel, so he uses his mother's phone to call the number. After numerous phone calls and transfers, Alex learns that Jonah is now in London, and Alex leaves a message for him at his office.

Despite working a full day and being away from his family, Alex searches for a way to contact Jonah until the early hours of the morning, meaning that he is losing sleep. On top of the stress of his management role, Alex's frequent travel and loss of sleep suggests that his corporate career takes a significant toll on his personal health and wellbeing. Rather than live a regular, sustainable lifestyle, he is constantly moving and acting, never resting.



Alex dozes by the phone for 45 minutes until Jonah calls back. Jonah immediately asks Alex if he's figured out what the goal of his manufacturing plant should be. Alex answers that their goal must be to make money, but he tells Jonah that he needs better metrics to understand if his plant is meeting that goal.

Alex's sense that he needs a better way to measure productivity implies that although a clear goal is important, it must be supported by strong metrics that can help measure progress toward that goal.



Jonah congratulates Alex for finding the answer. He offers three new measurements to operate by: throughput, inventory, and operational expense. "Throughput" describes the money generated explicitly through sales. "Inventory" describes the money used to purchase goods which a business might eventually sell. (Alex notes that this is a very different definition of "inventory" than he traditionally hears.) "Operational expense" describes the money a business uses to make inventory into throughput. Jonah cautions Alex that the metrics are very precisely defined, and Alex should not try to change his definitions. However, Alex will have to figure out how to implement these metrics himself, since Jonah must leave. He hangs up. Alex sleeps in his old bed for the remaining few hours of the night.

Since Jonah represents Goldratt himself, Jonah's proposed metrics to Alex are also Goldratt's proposed metrics for any businessperson. Notably, all three of Jonah's metrics describe how money moves into or out of the manufacturing system and therefore directly relate to the overall goal of making money. By orienting guiding metrics around the primary goal, one can thus understand directly how each measurement taken directly affects one's success or failure.



CHAPTER 9

Alex wakes in his mother's house at 11 a.m. He quickly calls Fran to tell her he'll be at the plant soon. Fran tells Alex that there are several issues that need his attention: broken machines, a fight on the factory floor last night, and a message informing him that Granby will be shooting a promotional video about robots in Alex's plant. Apparently, Granby's communications people think that Granby will look best in front of Alex's machines. Alex eats breakfast with his mother before leaving. His mother can sense that he is stressed and overwhelmed and encourages him to take better care of himself, no matter how bad things at work are.

The flurry of problems at the plant, all of which Alex must solve as the manager, demonstrates how stressful management can be. Alex's mother recognizes that he needs to rest more, eat properly, and take better care of himself, indicating that the personal toll of Alex's corporate career is plain to see. However, his mother's advice to prioritize his personal health directly contradicts Alex's habit of prioritizing work above all else.



As Alex drives to the plant, he thinks about Jonah's new metrics—which aren't so different from what he brainstormed with Lou—and how to apply them to the overall goal of making money. Alex decides the plant needs to increase its throughput while keeping operational expense and inventory as low as possible. He wonders if the robots further that goal, since they didn't reduce the number of workers the plant employs. Instead, they just add to the operational expense. When Alex arrives at the plant, he asks Lou whether having the robots has increased their sales. They look through charts and data and realize that the installation of the robots correlates with a *decrease* in sales.

Using Jonah's new metrics, Alex can immediately see that robots did not increase their throughput, demonstrating how simpler metrics can provide clearer insight into new developments. Although the robots represent the latest manufacturing technology, Alex realizes that they do not help the plant achieve its goal, suggesting that new technology may be counterproductive rather than productive—especially if used in the wrong way.



Alex decides they need to talk to Stacey Potazenik, their inventory control manager. When Alex asks her if the robots increased the inventory of unfinished products, Stacey tells him that of course they did, though she tried to stop it. When the robots first arrived, they only operated at 30 percent efficiency, since there was not always necessary work for them to do. Stacey knew that Ethan Frost would be furious about inefficient robots, so everyone decided to make the robots build spare parts so that they could always be running, increasing their efficiency. However, those parts often go unused, because the plant suddenly has shortages of other parts and can't complete projects.

Alex brings Bob Donovan into the conversation and asks him about the robots. Bob insists the robots are doing a good job but admits that inventory keeps increasing because the plant struggles to predict what parts it will need, so they build things that are never used. They often have a surplus of one thing and a shortage of another, which causes delays. Alex starts pacing the room and summarizing that although the robots are themselves efficient, they increase inventory, which costs money to store and move. They didn't increase sales, so it appears that the robots are losing them money rather than making it. Alex exclaims that they "haven't been managing according to the goal," and he says that he has some new ideas to explain to them all.

CHAPTER 10

After an hour and a half, Alex has explained Jonah's concepts and new metrics to his staff. Lou observes that all of Jonah's metrics directly relate to how much money is made or lost in any action. Furthermore, Jonah's new metrics account for all of the old metrics they traditionally use but simplify them and make them less confusing. Bob, who remains wary of the new system of measurement, bickers with Lou, who sees the value in it. The four of them continue to debate how various functions and costs fit into throughput, inventory, and operating expense.

The conversation briefly derails when Alex mentions that Granby will be at the plant in a few weeks to shoot his video. Lou, Stacey, and Bob worry about looking good for Granby. However, all Alex cares about is how to change the way they use their robots to make them productive toward their goal rather than counterproductive. To reiterate how important this is, Alex tells Stacey and Bob about Bill Peach's ultimatum: they must become profitable within three months or the whole plant closes. They all agree that they should lower inventory because it wastes money, but they worry about giving the robots less to do, since lower efficiencies might upset Peach. Stacey suggests that they should call Jonah and ask for more help.

Stacey increases the robots' on-paper efficiency by making them do unnecessary work, even though it creates excess inventory and ultimately wastes money, all to satisfy Ethan Frost and the corporate superiors. This suggests that because corporations use flawed traditional metrics, actions that are meant to increase productivity (like increasing individual efficiency) are instead counterproductive to the primary goal of making money.



Bob's admission that inventory keeps rising because the plant can't accurately predict what it will need demonstrates the logistical complexity of operating a manufacturing system. Under their current mode of operation, it is nearly impossible to keep a consistent flow of production moving. This complexity and Alex's realization that the robots lose them money rather than make them more demonstrates the need for a clear guiding goal, which will help them organize their system and its priorities.



Lou's observation that all of their traditional metrics can fit into throughput, inventory, and operating expense suggests that Goldratt's new measurements are not completely changing the way people do business, but simplifying it and making it easier to understand. Simpler metrics produce a clearer picture of where money is being made or lost in a complex system.



Lou, Stacey, and Bob's concern about looking good for Granby appears to outweigh their concern for running a successful plant, suggesting that the pressure of corporate hierarchy often impedes good business practice. Additionally, their fear of upsetting Peach with lower on-paper efficiencies suggests that traditional corporate metrics can also be a hindrance. However, Peach's ultimatum forces Alex and his staff to implement swift and immediate changes.



From their meeting, Alex calls Jonah's number in London, but his office tells Alex that Jonah is currently in New York. Alex calls his hotel, realizing that it is the middle of the night there. Jonah answers but tells Alex that he needs to sleep—if Alex wants to talk, he should meet Jonah at his hotel for breakfast in the morning. When Alex hangs up, the rest of his staff encourage him to make the trip.

Alex's willingness and his staff's encouragement for him to make a last-minute, overnight trip to New York suggests that they are desperate for solutions to their problems with the plant.



CHAPTER 11

That evening, Julie is angry at Alex for going on an unannounced trip. Alex tells her it's completely necessary but realizes that she doesn't trust him anymore. Julie accuses him of always putting work first and family second. Alex tries to hug her, but she pushes him away, and when he tells her that he'll call her from New York, she warns him that she might not be around. Alex yells at her for being unfair, to which Julie counters that he is the one being unfair. Alex leaves with his bag.

Julie's feeling that Alex always puts work first and family second indicates that she expects him to do the opposite and prioritize his family. Meanwhile, Alex accusing Julie of being unfair for being angry at him indicates that he believes he must put work before family. Their contrasting views suggests that they fundamentally disagree about what the goal of their marriage should be.



The next morning, Alex meets Jonah for breakfast in his New York hotel. He already tried calling Julie and the kids, but no one picked up the phone. Over coffee, Alex explains Peach's three-month ultimatum and asks if Jonah can be his consultant, but Jonah insists he does not have the time. However, he will give advice, and after three months, Alex can pay him whatever he thinks his advice was worth. Alex agrees to the terms.

Julie's refusal to answer the phone foreshadows future fights and even a potential separation. Meanwhile, Jonah's willingness to simply let Alex pay him what he feels his advice is worth suggests that Jonah is extremely confident that he can make Alex's plant profitable again.



Jonah smokes a cigar and asks Alex what he thinks when he sees one of his workers standing idle at the plant when there is no work to do. Alex states that idle workers are obviously inefficient, because the company still must pay them for their idle time. Jonah counters that, actually, "a plant in which everyone is working all the time is very inefficient." The fact that Alex's plant has so much excess inventory proves this. Jonah states that like most managers, Alex focuses too much on trying to balance his plant's capacity with the market demand (the rate at which they can sell the products they make). However, Jonah says that the closer a plant comes to being perfectly balanced, the closer it is to going bankrupt, which stuns and confuses Alex.

Notably, Jonah distinguishes between individual efficiency (an idle worker is inefficient when measured on their own, since they could produce more) and the overall efficiency of the system, or how well optimized it is to produce. Jonah's belief that idleness does not necessarily mean wasted money and that a balanced plant is at risk of bankruptcy both defy conventional business wisdom, indicating that many of Jonah's beliefs are counterintuitive and break with tradition.



Jonah explains that while a balanced plant might be appealing in theory, since expenses are kept to a minimum, “dependent events” (stages of a process that can’t begin before the stage before it completes) and “statistical fluctuations” (unexpected variations in how long a task takes to complete) mean that any system needs some flexibility to accommodate unpredictable events. On their own, dependent events or statistical fluctuations are easy to account for. Together, however, they cause serious delays, especially when a manufacturing system is too well-balanced and too lean to accommodate error. Jonah tells Alex that he must go, but he invites Alex to consider what these two factors mean for his plant. Jonah rushes away and climbs into a limo with some sort of chairman.

Jonah’s insistence that a balanced plant is very dangerous attacks the assumption that a lean plant without excess capacity is the ideal profit-making system. Once again, Jonah presents counterintuitive advice on how to manage a business system, indicating that he intends to revolutionize the way that Alex and others do business. Jonah’s meeting with some type of chairman in a limo suggests that despite his easy demeanor, he has become an important, respected figure.



CHAPTER 12

Alex recalls a man in his company who came home one night to an empty house, discovering that his wife had taken everything and left him. He fears he will find the same thing. However, when he arrives and sees that Julie is home, he is angry at her for not picking up the phone. She tells him that the kids were at a friend’s house, and so was she. Alex accuses her of having an affair, but she tells him she just spent the night with her friend Jane so that she’d have someone to talk to.

The man that Alex recalls demonstrates the worst consequence of neglecting one’s family because of a corporate career, and he thus serves as a foil for what Alex’s life could become if he does not change his ways. Alex’s accusation that Julie is having an affair indicates that he does not trust his own wife.



They argue about how little time Alex spends at home and how neglected Julie feels, since he always puts his career before her. Although Alex claims it’s just because of the current crisis, Julie doesn’t believe he’ll ever change. She asks if he can’t at least bring some of his paperwork home and do it there, so he’ll be present. Alex says he’ll try. They kiss and admit that they missed each other. Alex promises that he’ll spend all weekend with Julie.

Julie’s request that Alex bring some of his work home with him represents a compromise between her relational needs and his career demands. It also suggests that what Julie wants most from Alex is time and attention, more than the money that he makes for them through his corporate job.



CHAPTER 13

On Saturday morning, Alex lies in bed next to Julie, who is still asleep. His son, Dave, is standing in front of him in his Boy Scout uniform, reminding Alex that he promised to go on their overnight hiking trip with them weeks ago. Alex feels bad about abandoning Julie, but feels like he should go, so he quietly gets out of bed and drives with Dave to the hiking trail. When they arrive, the other **hikers** tell Alex that their scout leader is sick, so now Alex is the only adult available for the trip. He’s irritated that this hike is suddenly his responsibility, but he decides to lead them. The boys show him the map which will lead them to Devil’s Gulch, where they’ll camp for the evening.

Alex’s personal life is plagued by competing commitments to his wife and kids, which he struggles to manage. His personal life thus parallels his career, in which Alex struggles to manage the various crises and demands of his management position. This suggests that Alex struggles to manage his life overall—to juggle the competing demands of family, career, and personal wellbeing—indicating that much like the factory’s current operating procedures, Alex’s lifestyle is unsustainable.



They have about 10 miles to hike and, at an easy pace of two miles per hour, Alex estimates it should only take five hours to reach their destination, plus an hour and a half added for lunch and rest breaks. The group starts hiking a well-marked trail single-file. The **hikers** begin together, but Alex notices that the boys quickly begin to spread out along the trail, some hiking faster than others. He lets a boy named Ron take the lead and moves to the back so he can keep an eye on the whole procession. Alex notices a chubby boy, Herbie, in the middle of the group who hikes slowly and thus slows down the boys behind him.

As they walk, Alex thinks about Julie and his conversation with Jonah about statistical fluctuations and dependent events. In Alex's mind, such fluctuations should average themselves out. For instance, while he's hiking, sometimes he'll hike faster and sometimes slower, but it should average out to two miles per hour. Looking up, he notices that Ron is too far ahead, so he calls out for the **hikers** in front to stop while everyone else catches up. Some of the other boys make fun of Herbie for being slow as he struggles to catch up, though Herbie's backpack looks especially heavy. It takes a long time for the boys behind Herbie to jog up to the boys ahead of him.

As they stop for a rest, Alex tells Ron that he should've kept a moderate pace, but Ron insists that he did. Although Alex thinks they've been hiking for several hours, Ron's map shows that they've only hiked two miles—far less than their average speed would predict. When they start hiking again, though Ron hikes at a moderate speed, Alex sees that the line of **hikers** spreads out and slows down again. He realizes that each hiker is essentially a dependent event whose speed fluctuates up and down. Whenever someone slows down for a step or two, everyone behind him must slow down as well, and they cannot simply run to fix the fluctuation because they are constrained by the hiker in front of them.

Alex realizes there are athletic limits to how fast each **hiker** can go, but no limits to how slow or how long they can be delayed. So rather than the fluctuations in hiking speed averaging themselves out, the negative fluctuations accumulate, the hikers spread out, and the whole group slows down. Alex considers how these sorts of fluctuations create problems in the plant, since each machine is like a dependent event; it must wait for the machine before it to finish its work before it can even begin. The distance between Ron, in the front of the line, and Alex, in the back, represents the plant's increasing inventory. Alex's slowed walking speed represents the plant's decreasing throughput. Soon enough, Ron stops the whole troop for lunch.

This section introduces Goldratt's Theory of Constraints, which the novel usually refers to as "bottlenecks." Essentially, a constraint or bottleneck is the slowest stage of a process. The hikers along the trail symbolize Alex's manufacturing system at the plant. Each hiker represents one stage of manufacturing, where raw material is gradually processed into an industrial product that can sell. Their struggle to stay together as a group or maintain a consistent pace symbolizes the disorganization and inconsistent flow that the plant suffers from.



Since the hikers represent the manufacturing system, Herbie, as the slowest hiker, represents the system's chief constraint—its bottleneck. Alex's observations about Herbie's struggle to maintain the pace of the rest of the boys and need to intermittently run to stay with the group demonstrates how such a bottleneck can disrupt the pace of the entire system if it's not proactively dealt with.



Each hiker is constrained by the speed of the hiker in front of them, meaning that even if they wanted to run to catch up to the hikers in front of the group, they could not. This implies that the occasional delays of the hikers in the front of the group will have a compounding effect for every person behind them. In terms of manufacturing, whenever a stage in the process has to wait on materials or has a machine error, every subsequent stage of that process is thus thrown off schedule.



The fact that negative fluctuations compound on one another, rather than averaging themselves out, implies that whenever time is lost in one stage of the manufacturing system, it is very difficult to recover by simply speeding up another stage. Additionally, the increasing distance between Ron and Alex represents increased inventory, suggesting that more money is trapped as inventory in the system, rather than being regained through sales or being available as cash on hand.



CHAPTER 14

As the scout troop breaks for lunch, Alex wonders why they have not made as much progress as they should have. He thinks he might make the **hikers** more efficient by trimming their individual capacity so that they'll each maintain the two mile per hour hiking speed. He wants to test this. Alex notices a kid rolling some dice around on a nearby picnic table and asks to borrow them. He finds a box of matches and a few aluminum bowls and arranges the bowls on a line as if they were the stages of a manufacturing line. The matches represent the pieces of product moving through each stage, and the dice represents the statistical fluctuation in each stage.

A few kids, including Dave, notice Alex and his matches and bowls. Alex tells them that he's inventing a game and enlists them to play. He explains that each kid will sit in front of his bowl and roll the dice in turn to see how many matches he get to move from the prior kid's bowl into their own—the goal for the whole group is to move as many matches as possible from one side of the table to the other. Because the dice can roll any number between one and six, Alex and the boys agree that the number of matches moved per roll should average out to three and a half. Alex decides that he'll keep a tally of each boy's match movements. Whoever keeps averages higher than three and a half wins the game and won't have to do dishes in the evening.

Andy, the first boy, rolls a two, so he moves two matches from the matchbox into Ben's bowl. Ben rolls a four, but because he only has two matches in his bowl, can only move two matches. The next boy, Chuck, rolls a five, but he still can only move the two matches that Ben gave him. Chuck thinks this is unfair, but Ben tells him they'll roll better next round.

As the boys continue rolling, Alex realizes that the further back in the line each boy is, the more each other boy's low dice rolls affect him. Even if Dave and Evan, the last two boys in the line, roll high, they can never move more than two or three matches at a time and their average score plummets. Alex is both stunned and troubled. Although the match system should be balanced by the law of averages, the whole process can never maintain the predicted average for more than the first round. He glumly thinks about his plant and all of the orders that they are never able to deliver on time.

Alex's assumption that the hikers' speed should fluctuate up and down and average itself out implies that he believes the stages of his manufacturing process will do the same. Even when one operates at a slower than average speed, it should be able to compensate with a faster than average period as well. The fact that each match must move from one bowl to the next means that the bowls are a series of dependent events.



Alex and the boys all agree that the system should hold its average of three and a half matches per turn, suggesting that the basic assumption Alex makes about statistical fluctuations is intuitive. Notably, even while Alex is hiking with his son, he is primarily thinking about work and using the hikers to help solve his own problems. This suggests that Alex considers his work to be the center of his world, superimposing itself even onto the time that he spends with his family.



Ben and Chuck's productivity (moving matches) are limited by Andy's initial roll, suggesting that any delay in the early stages of a manufacturing system limits the progress of every subsequent stage.



As Jonah said, the combination of dependent events and statistical fluctuations causes serious problems for a manufacturing system. If each boy was not dependent on the rolls of the boys before him, he would likely maintain a statistical average close to what Alex projected. However, since each boy is constrained by both his own roll and the rolls of those before him, low rolls create compounding delays and productivity losses.



CHAPTER 15

After lunch, the **hikers** begin again, though Alex notices that they've rearranged themselves according to speed. The fastest boys take the lead, and Herbie brings up the rear in front of Alex. This only makes the line of hikers stretch out more quickly, however. Although everyone else can hike at whatever speed they want, Alex has to slow to Herbie's pace. Alex realizes that this means the slowest member of the group thus governs the overall pace of the group. It doesn't matter how fast the fastest kids are—Alex, at the back (representing the group's throughput) can only move as fast as the slowest variable.

A sign marker along the trail indicates that they still have five miles to go, meaning that the **hikers** have been moving an average speed of one mile per hour, rather than two. However, realizing that the slowest variable governs the pace of the group gives Alex an idea. He shouts up the trail for everyone to stop hiking and hold their place in line. When everyone is together, Alex reverses the order of the line so that Herbie hikes in front and the fastest kids are in the back. When the fast kids complain, Alex explains that he's not trying to make them fast, but to keep them hiking together.

As the **hikers** begin again, Alex is pleased to see that they stay together as a group for the first time. Each hiker is capable of matching the speed of the boy in front of him. Soon after, the boys behind Herbie notice how heavy his pack is and divide up some of his gear for him. Without the extra weight, Herbie can hike faster and the whole troop moves along at a good pace, all staying together. Alex thinks, "Inventory is down. Throughput is up." They reach their destination and Alex calculates that after reorganizing, the hikers achieved their proper average speed of two miles per hour. As they make camp and settle in for the night, Dave asks Alex how he knew to reorganize, and Alex shares what he learned on the hike.

CHAPTER 16

When Alex and Dave get home the next afternoon, the house is empty. Dave finds a note on the table from Julie, explaining that she can't always be "last in line" for Alex's attention; she's leaving for a while, and she left Sharon with Alex's mother. Alex picks Sharon up from his mother's house, and she is obviously shaken. That evening, Alex explains to his children that he and Julie are having problems, but the kids seem almost numb. After, he calls Jane's house to see if Julie is there, but no one answers. He calls her parents too, but they are as surprised as Alex that she left. Julie's mother, Ada, asks Alex what he did to make her leave.

This organization of hikers represents the manufacturing system when it is set up to allow for the maximum efficiency of each worker and machine—each hiker (or stage in the manufacturing process) can operate at its full capacity 100 percent of the time, since no one in front is slow enough to create a constraint. However, the fact that the hikers immediately spread thin implies that inventory skyrockets, losing money for the plant and making this an unsustainable way to organize.



Just as the first order of hikers meant that nobody was ever constrained by anyone else, this reverse order ensures that everyone is constrained, which means that their individual efficiencies are low. However, if the group can stay together, the short distance between Herbie in the front and Alex in the back suggests that their inventory stays as low as possible, which is ideal. Thus, a system that appears inefficient actually wastes less money than an efficient system.



The other hikers dividing up Herbie's gear and allowing him to hike faster represents Alex increasing the capacity of his chief constraint, his bottleneck, which allows the entire system to move faster. By pacing according to the slowest hiker, the hikers maintain a consistent, sustainable speed for everyone which creates fewer delays and allows for a higher average pace. Alex's realization that inventory decreases while throughput increases suggests that with this organization, his plant will become more profitable.



Julie's leaving demonstrates that Alex, or anyone in his position, cannot continuously neglect his spouse and depend on her patience and understanding indefinitely. Alex's marital crisis parallels his crisis at the plant, since in both cases he struggles to manage a series of complex problems and demands.

CHAPTER 17

Monday starts terribly. Dave and Sharon try to make breakfast but make a huge mess instead. Alex drops them off at school and arrives at the office to a phone call from Hilton Smyth, demanding some missing part of an order be entirely shipped by tonight. After he hangs up the phone with Smyth, Alex finds a memo announcing that Smyth was elected to be the division's new productivity manager, and that Alex must now report to him as well.

Alex expects his staff—Bob, Lou, Stacey, and Ralph Nakamura, his data processor—to be as thrilled as he was about what he figured out with the **hikers**. However, after hours of drawing diagrams and explaining his discovery to them in a conference room, they seem unconvinced that those things actually apply to the plant.

As they are speaking, an expeditor asks to speak with Bob about Smyth's order of 100 parts—if Pete's (one of the supervisors) workers maintain their regular pace of 25 parts per hour for the next four hours, they can finish the order on time, but only barely. Each part will need to be worked on by Pete's workers in one stage and a robot in the next. Alex suggests that they should be able to see his point about statistical fluctuations and dependent events in action, so he makes a chart predicting the output and average fluctuations and orders Pete to keep a careful log of their actual output. He bets Bob \$10 that they don't make the order on time due to fluctuations.

After the meeting, Alex calls his mother to ask her to move in with him and take care of the kids while Julie is gone. He leaves to pick her up and let her into his house, and when he gets back in the afternoon, Bob meets him exclaiming that Pete's workers finished their stage of all 100 pieces—in their first hour, they produced less than average but sped themselves up later to make up the difference. However, when Bob and Alex check the robot's progress, they realize that even when Pete's workers did more than their average in an hour, the robot was still constrained by its operating capacity of 25 parts per hour. Since it couldn't work at full capacity for the first hour, the robot had to do its work in five batches and took longer than the allotted four hours to finish all 100 pieces. Although they missed their deadline, Alex is glad for what the episode proved.

Dave and Sharon's inability to take care of themselves in the morning suggests that Julie's absence will make the family environment less stable and controlled. Meanwhile, Smyth's promotion indicates that his obvious pandering to Peach has paid off, suggesting that rising in the corporate world may be influenced as much by posturing as it is by performance.



Alex's staff's hesitation about his new ideas suggests that, in an environment as complex as a multistage manufacturing system, people often struggle to identify clear patterns or phenomena.



The fact that Smyth's order requires two different stages of production makes it a system of dependent events, implying that any delays will compound themselves throughout the process, rather than averaging out. Alex's bet that they won't complete the order suggests that he is already confident that their system is fundamentally flawed. The robot should maintain a predictable output, meaning that even if only one stage fluctuates its speed, delays will still compound.



Pete's workers are able to speed themselves up to compensate for their early delays, demonstrating that an independent event can easily maintain its statistical average. However, the fact that the robot cannot operate at full capacity because of Pete's workers' early delays demonstrates that in a chain of dependent events, every delay is passed down the entire chain; although Pete's workers can maintain their own average, their initial delay throws off the robot's pace. This is the fundamental problem that Goldratt's Theory of Constraints seeks to solve.



CHAPTER 18

That evening, Alex comes home to find his mother with Sharon and Dave, cooking dinner. Sharon tells Alex that Julie called but wouldn't tell them where she is. On Tuesday morning, Alex arrives at his office to find Bob, Stacey, Lou, and Ralph there waiting for him. They discuss what happened the day before. Alex points out that they had crippling fluctuations with only a two-stage process. Most of their manufacturing processes require as many as 15 stages, creating even more fluctuation. Alex reasons that they can no longer measure a machine or worker's efficiency or productivity on its own—they have to consider it in terms of the entire process it contributes to.

Stacey suggests they call Jonah again, so Fran spends the next hour trying to get him on the phone. When they do, Alex explains to Jonah what happened with Herbie and that he needs to optimize his entire system, rather than make each piece efficient. Jonah tells Alex he is correct. He explains that some parts of a system are a “bottleneck resource,” a resource (or machine) who cannot keep up with the demands placed on it, making it the slowest piece of a system. They should aim to make their bottleneck's capacity close to the market demand; the bottleneck should produce products at the same rate they can be sold. Bottlenecks, Jonah says, are neither bad nor good—they just exist and should be used to pace the entire system. Jonah must go, but he tells Alex and his staff to spend the next several days determining what their bottlenecks are.

A few days later, the conference table is covered with charts, data sheets, printouts, and so on as Alex, Bob, Stacey, Lou, and Ralph search for their bottlenecks. Ralph is frustrated—much of their data is years behind, and sorting through it could take months. Bob realizes that with his 20 years of experience at the plant, he could list off where delays usually happen, since logically, that must lead them toward the bottleneck machines. Stacey adds that the parts which are most often in short supply probably run through the bottlenecks too, so they could cross-correlate the two lists. Alex estimates that whatever machines have the most unfinished inventory in front of them might provide clues as well.

Not long after, they find themselves gathered in front of their bottleneck machines: the NCX-10, a one-of-a-kind machine for shaping metal that requires little human labor, and a heat-treating machine that cooks steel to keep it from becoming too brittle after it's been cut. Both machines run with limited capacity, and their operations take several hours to complete a single batch of parts. Bob and his people struggle to run either machine with a full batch of parts inside it, due to the plant's complicated logistics.

Alex's argument that they must measure the productivity of the entire system recognizes the distinction between individual efficiencies and the entire system's optimization. Just as when the hikers were allowed to be efficient and hike at their own pace, the entire group's average pace slowed, each manufacturing machine operating at full efficiency will presumably disrupt and slow the entire manufacturing system. As with most of Jonah's ideas, this concept defies common intuition.



Per Goldratt's Theory of Constraints, “constraints” and the novel's “bottlenecks” are the exact same thing. The image of a bottleneck is apt, describing the narrow point that slows the flow of water (or the flow of a manufacturing process) from the bottle into another vessel. Jonah's direction to use the bottlenecks to pace the entire system suggests that, far from being a negative, bottlenecks are quite useful. The bottleneck's capacity informs the manager how quick a pace the entire system can maintain—so long as they can make enough sales to keep the bottleneck busy and productive.



Alex and his staff's inability to rely on data allows Goldratt to demonstrate that bottlenecks can be identified qualitatively as well as quantitatively. That is, one should be able to identify a bottleneck not just by metrics, but by the overall activity of the plant, since there will always be inventory waiting to be processed at bottleneck sites. This fact allows managers to more quickly and confidently identify the bottlenecks in their systems.



Bob's struggle to keep either machine operating at full capacity implies that both bottlenecks, on top of being the slowest parts of the manufacturing system, are running even slower than they have to, costing more time and money. This is akin to Herbie hiking at half his normal speed, slowing the entire hiking troop down even more than he normally would.



With disappointment, Alex realizes that reorganizing the plant won't be as easy as reorganizing **hikers**—neither the NCX-10 nor the heat-treating machine can simply be moved to the first stage of production. The plant can't afford to buy new machines to increase their total capacity, either. Stacey suggests that they may be able to save some time by changing their loading and set-up procedures, but it seems uncertain.

Alex's frustration suggests that while the Theory of Constraints is quite simple, implementing it in an actual system can be more complicated. That system may have extra requirements, such as the particular order in which each of its resources must operate.



CHAPTER 19

Alex eats dinner with his mother, Dave, and Sharon. Noticing that Alex is distressed, his mother encourages him to share his problems with the family. Alex tells her that some of the problems at the plant feel unsolvable. Dave is shocked to hear that what they learned on the **hike** didn't easily apply to the plant. Alex's mother tells him that he should talk to Jonah again, and Alex says that he is about to go pick up Jonah from the airport.

Although Alex's life still revolves around his work, sharing his work problems with his mother and children at least allows them to understand what occupies so much of his mind. As such, this represents a small step forward in Alex maintaining a healthier relationship with his family.



After Alex told Jonah of his new confusion about the bottlenecks over the phone, Jonah offered to come see the plant for himself. Alex picks him up from the airport and drives him to the plant, explaining their new problems on the way. When Jonah arrives at the plant, Bob, Stacey, Ralph, and Lou meet him. Bob states that they still need a way to increase their throughput without raising their operational expense. They need more capacity. Jonah assures them that if they can raise the capacity of the bottlenecks, they'll raise the capacity of the entire plant. When the group of them goes to see the first bottleneck, the NCX-10, they see that it is not running, since the union workers who operate it are on their break.

Although the bottlenecks have limited maximum capacity, the fact that Alex and his staff find the NCX-10 idle indicates that it has capacity which is currently not being used. If the speed and capacity of the bottlenecks sets the capacity for the entire plant, any wasted bottleneck capacity necessarily means that the plant is producing and profiting less than it could. The NCX-10 sits idle because workers are on a legally-required break, suggesting that some loss of capacity occurs for legitimate reasons.



Jonah advises that the workers should take their lunch break while the NCX-10 is in the middle of a batch, still running on its own. He states that while any non-bottleneck machine may have some idle time, bottleneck machines need to be running at full capacity all the time, since that determines how fast everything else in the system move. He asks if there are other machines that perform the same function as the NCX-10, and Ralph tells him there used to be, but they were less efficient, so the plant sold them. Looking at the second bottleneck, the heat-treating machine, they see that there is a large stack of parts—about 1,000 pieces—waiting their turn to be treated.

Jonah's assertion that the bottleneck machines should always be running suggests that bottlenecks are the only place where individual efficiency truly matters, since it effects the productivity, and thus the throughput, of the entire system. Ralph's admission that the sold the less-efficient counterparts to the NCX-10 suggests that in the plant's obsession with individual efficiencies, it actually reduced its bottlenecks' capacity and thus reduced its own throughput, demonstrating the folly of prioritizing efficiency.



Jonah asks if they could outsource some of the heat-treating work to vendors in town, and Stacey says that they could, though it would cost some money. Sensing that they do not understand, Jonah calculates that if each of those parts in the stack delays shipping a product, and if each of those products sell for \$1,000, then the total value of that delay is \$1 million. This realization shocks Alex. Jonah asks to see where they do quality inspection for bottleneck parts. He sees that they do quality inspection only after products go through the heat-treating machine, meaning that they are sending some defective units through the bottleneck. To save time and money, Jonah recommends they only heat-treat after they do quality control, so that no valuable space in the bottleneck will be occupied by faulty parts.

Jonah explains that although Alex and his staff would normally calculate the operating expense of each bottleneck machine based on its power and labor requirements, coming out to \$20 to \$30 an hour, their basic assumptions are wrong. Because the bottlenecks dictate the pace of the entire plant, they should calculate their operating expense as the total monthly cost of the plant (\$1.6 million) divided by the maximum number of hours the bottlenecks can run (585 hours). With this system of measurement, each hour of delay on the bottlenecks costs \$2,735, since overall production is delayed—not just the bottlenecks alone. This makes it critical not to lose any operating time on the bottlenecks at all.

The next morning, Alex eats breakfast with his mother and the kids. They tell him that Julie called again last night and still wouldn't say where she was, but they heard violin music in the background, which Julie's dad likes to listen to. Alex decides that he'll call Julie's parents later.

CHAPTER 20

When Alex gets to the office, he calls Julie's mother, Ada, to ask if Julie is at their house. Ada tells him that she is, but that she doesn't want to talk to Alex—not after he's neglected her for so long. Ada hangs up on him. Afterward, Alex holds a meeting with his staff to decide how to implement Jonah's advice. Lou determines that at least 80 percent of everything they work on must pass through the bottlenecks. They decide to do quality inspections on parts before sending them through the bottlenecks, to worry less about efficiencies, and to prioritize manufacturing overdue orders before starting new jobs.

Jonah asserts that any delay on a bottleneck not only costs the operating cost of the machine, but also the lost value of any products not created due to that delay, since the bottleneck holds up the entire system. Jonah's suggestion about outsourcing heat-treating and moving quality control suggests that even when a bottleneck's capacity cannot be increased on its own, there may be other ways for a manager to increase its efficiency, such as ensuring that only pieces that are absolutely necessary pass through the bottlenecks.



Jonah's recalculated operating costs for the bottleneck machines demonstrates that the Theory of Constraints requires one to rethink the metrics they use to measure productivity, as well as their logistical process. Thus, the Theory of Constraints that Goldratt proposes through his novel is an entirely new way to approach measuring and operating complex systems which breaks traditional ideas about how such systems operate and reveals the true cost of poor business practices.



Alex's efforts to locate Julie demonstrate that, despite his over-commitment to his work, he does want to save their marriage. That is, his problem is not that he does not care about Julie, but rather that he does not know how to manage her needs alongside his career.



That evening, Alex drives to Julie's parents' house unannounced. He knocks on the door, but Ada refuses to let him see Julie, so Alex tells her he'll just sit in his car and wait. After 45 minutes, Julie comes out and stands in the lawn. She tells Alex that she's considering a divorce, but she needs time to think about it. Alex asks if she's having an affair, which offends her. He tries to promise that things will be better, but she no longer believes him. Then, he presses her to choose whether she wants to divorce him and abandon the kids or come home with him and make their marriage work. Julie refuses to decide yet. Alex tells her he loves her, and Julie gives him a brief kiss before going back inside. Frustrated, Alex drives away.

Alex's accusation that Julie is having an affair indicates that he does not fully understand what he did wrong and assumes the fault must somehow lie with Julie. Although Alex clearly wants to save his marriage, he has not yet taken responsibility for the pain that his corporate lifestyle inflicts on his family. This indicates that he is still nearsighted and selfish, unable to recognize his own faults and how he has failed to meet Julie's emotional needs.



CHAPTER 21

At home, Alex wonders what it would be like to date women again if Julie divorces him. He thinks about who he could ask out for a while, but he realizes there is only one woman he wants to date. He calls Julie at her parents' house and asks if she'll go out with him on Saturday, and she agrees.

Alex's decision to date Julie again suggests that he simply wants to spend time with her, which is exactly what she wanted from him all along. It seems that the goals they each have for their relationship are finally aligning.



At the plant, Ralph gives Alex his compiled list of all 67 overdue orders they have outstanding. Eighty-five percent of them are waiting on parts from the bottleneck machines. Alex tells Ralph and Stacey to prioritize those parts and start working their way through the list. After, he meets with the union representative Mike O'Donnell, who is angry that Alex wants to move the lunch hour around. He worries that if the union lets Alex move the lunch hour, he'll try to gain other concessions from the union too. Alex explains that moving the lunch hour is just part of a scheme to keep the plant from closing. O'Donnell tells Alex he'll think about it.

O'Donnell's distrust of Alex's requests suggests that corporate leadership and labor unions are often at odds with each other. O'Donnell's fear that Alex will try to gain further concessions implies such things have happened in the past. This depicts corporate leadership as hawkish, seeking to exploit their workers as much as possible without the unions holding them back, adding to the grim depiction of the corporate world.



That afternoon, Alex sees that the NCX-10 is idle again. He confronts the machinist, who says that they're waiting on the raw materials to show up for the orders at the top of the list, since Alex had said not deviate from the priority list. Alex finds Bob and confronts him as well, and Bob explains that although the management staff is trying to prioritize overdue orders, there is no way for the machinists to tell which parts are important to work on and which ones are secondary. Bob is frustrated.

In this case, the bottlenecks are delayed by complex logistical problems rather than personal error, demonstrating the difficulty of maximizing a bottleneck's capacity. Again, though the Theory of Constraints is simple enough to understand, implementing it in real systems appears quite complicated.



Alex decides they need to come up with a method to sort and tag critical projects. He and his staff spend the next few days coming up with a tag system, placing red tags on the critical pieces that need to run through a bottleneck machine and green tags for non-essential parts. Alex spends all of Friday holding meetings with everyone in the plant to explain the concept of bottlenecks and the importance of their new tagging system. The tags will be numbered as well, to help people prioritize between pieces with the same colored tags.

Alex's need for tagging and organizing methods underscores the complexity of multi-stage manufacturing systems. It further suggests that although Goldratt's Theory of Constraints provides guiding principles for organizing a system, those principles will need support from smaller initiatives, such as tagging systems, to redirect the way in which that system operates.



That afternoon, O'Donnell tells Alex he can move the lunch breaks around; the union won't fight it. On Saturday evening, Alex washes his car, dresses up, and picks Julie up from her parents to take her on a date.

Alex's "first date" with Julie represents a turning point in their relationship in which he rediscovers that he enjoys simply being with her and stops taking her for granted.



CHAPTER 22

In Alex's office, his staff congratulates themselves—the first week with their new tagging system has helped them increase production and begin to reduce their overdue backlog of orders. Placing quality control before the bottlenecks rather than after eliminated six percent of wasted capacity, which should increase their throughput. Even so, Alex feels like it's not enough. He asks his staff for more recommendations on how to keep improving their system. That afternoon, Alex decides to add an additional yellow tag to the tagging system to differentiate between the bottlenecks parts that have already been processed by the bottleneck machines and those that haven't.

Although his staff celebrates their initial success, Alex's nagging feeling that they must always do more demonstrates the need for continuous improvement on a new system. However, while Alex's need to always do more is beneficial for his role as a manager, it parallels his need to always push further in his career, which fuels his over-commitment to his work and negligence toward his family.



Bob, who has been missing all afternoon, calls and tells Alex that he has something exciting to show him. Alex finds Bob unloading a large old machine from a truck. Bob explains that this machine, along with two others, are the machines that the NCX-10 replaced, since it could perform all three machines' functions on its own. However, with these three machines brought back, they can add to the work done by the NCX-10, thus increasing the capacity of one of their bottlenecks.

Although bottlenecks are defined as the resource with the most limited capacity, Bob's idea of bringing back old machines to help the NCX-10 demonstrates that they are often ways to increase the capacity of bottlenecks. Any such increase will increase the overall productivity and throughput of a system, which means greater profits.



CHAPTER 23

Alex sits in his office and thinks back to his date with Julie on Saturday night. They had fun together, and they've been meeting a couple of times per week since. Alex is tired, but happy with the arrangement. At that moment, Ted Spencer, who supervises the heat-treating machine, angrily tells Alex that Ralph is causing him trouble and asking for all sorts of data and reports. When Alex asks Ralph about it, Ralph tells him that he noticed that the heat-treating machine was sitting idle for hours because the operators were busy with other things. Ralph simply wants to collect data on actual operation times, so they can see where they're losing time and money due to bottlenecks. Alex is frustrated to hear about the idle bottlenecks and encourages Ralph to collect data for both the heat-treating machine and the NCX-10.

Alex meets with Bob to discuss the problem, and Bob tells him that since both the heat-treating machine and the NCX-10 take hours to process a batch, the operators are left with nothing to do, so they find other projects. Alex decides that they need to assign foremen to both machines full-time, even though those foremen will have a lot of idle time on their hands. Bob agrees to do it but warns Alex that they're individual efficiencies will appear to go down, on paper. The next day, Bob presents his plan to move some machinists around so that there are always operators attending the heat-treating machine and the NCX-10, who will eliminate any time that either machine spends idle. Bob also plans to set some machinists up on the three machines that can help the NCX-10 do its work.

Bob puts his new plan into practice. Over the next week, Ralph notes that one foreman, Mike Haley, consistently manages to process 10 percent more parts through the heat-treating machines than anyone else. Alex visits Mike during his shift, and Mike shows him how his workers pre-sort the batches that are about to be heat-treated, which cuts down on the time it takes to load each furnace and fits a few more parts in per batch. Mike also thinks that he could build a table that could be pre-stacked with parts and inserted into the furnace by a forklift, which would save several hours of loading time each day. Alex congratulates Mike on his ideas and tells him they'll turn his ideas into official processes. Alex wants Mike to keep innovating.

In addition, since the plant only heat-treats metal parts when they become brittle from cutting and shaping, Bob determines that by slightly adjusting the way they cut some parts, they can eliminate the need for heat-treating about 20 percent of all the parts that currently run through the furnace.

Although Alex and his staff were able to identify their bottlenecks without sufficient data, Ralph's desire to collect data to measure the bottlenecks' efficiency indicates that such data collection is still useful, especially amid a complex system. However, Ted Spencer's anger at being questioned about metrics and data collection demonstrates that management not only involves finances and processes, but also solving interpersonal conflicts between employees.



The operators' decision to look for other work during idle hours seems reasonable—they want to remain efficient and work hard, so they keep themselves busy. However, the fact that they cause delays on the bottlenecks and cost the plant money reiterates Jonah's assertion that individual efficiency is not the same thing as optimization—by focusing on keeping each person and machine efficient, a manager can actually lose money rather than save it. Ironically, idle workers may actually be a sign that the system is well-optimized and operating efficiently overall.



Just as Bob increases the capacity of the NCX-10 bottleneck by reusing old machines, Mike demonstrates that a bottleneck's capacity can be subtly increased by creating better operating procedures, especially when that bottleneck requires human input. Because the bottlenecks' capacity determines the productive capacity of the entire system, Mike's innovations will ultimately increase the plant's throughput and earn more money.



Bob's innovation effectively increases the capacity of a bottleneck by allowing some parts to sidestep it altogether. That is, allowing some parts to bypass the bottleneck is the same thing as increasing that bottleneck's capacity.



CHAPTER 24

On Friday, as most workers are going home, Alex's management staff come into his office with an open bottle of champagne and Styrofoam cups. They celebrate their last month of progress, since their throughput has improved and their work-in-process inventory has decreased. Bill Peach calls Alex, and Alex braces himself for criticism. However, Peach congratulates him on their good month. Peach's marketing man, Johnny Jons, told him that Alex's plant has been resolving many late orders recently. Alex thanks Peach for calling.

That evening, Alex and his staff get drunk in a bar, continuing their celebration. Alex is too inebriated to drive, so Stacey gives him a ride home. She tells him that he looks happier than he has in a long time. Alex can barely walk, so Stacey helps him to the front door. He trips over the doorstep and Stacey tries to catch him, but his weight pulls both of them sprawling into the house. Julie, who's come home, flicks on the lights, sees them both, and assumes that Alex is having an affair. She screams at him, gets in her car, and drives away again. Alex calls Julie's parents in the morning to explain, but Ada tells Alex that Julie won't talk to him.

On Monday, Stacey tells Alex that she feels terrible about what happened and will call Julie to explain. She also tells Alex that it seems their bottlenecks are spreading: now that the plant's throughput has increased, they are running into shortages of non-bottleneck parts. And since they've decreased their inventory of spare and unused parts, the new shortages are causing delays. Alex sighs and tells Stacey to figure out exactly which parts are coming up short, and then tells Fran to track down Jonah again. Alex looks over the plant and the declining piles of inventory, which seem like a good sign. When Jonah picks up the phone, Alex explains his problem. Jonah tells him he'll visit the plant.

In the evening, Julie calls Alex to apologize for assuming the worst; she'd come home unannounced to surprise Alex. Alex tells her that if he'd known she was back, he would've come home straight after work to be with her. They both decide to keep seeing each other and continue working things out.

Alex's staff's celebration and Peach's affirmation prove that Jonah's solutions are effective at increasing profit and eliminating wasted money in inventory. Additionally, Peach's improved demeanor toward Alex suggests that the easier an employee makes life for his manager, the kinder that manager will treat that employee—their relationship is performance-based.



Just as Alex assumed that Julie was having an affair, now Julie assumes that Alex is having an affair, indicating that neither of them trust each other. This again demonstrates the cost of Alex's commitment to corporate success: Alex and Julie have spent so little time together and become so alienated from each other that they've lost any mutual trust and automatically assume the worst of the other.



After Alex and his staff optimize their initial bottlenecks, new bottlenecks seem to emerge, suggesting that increasing the productive capacity of a system exposes its weaknesses at all points. As the bottlenecks are allowed to increase their capacity, any other resource that has a stunted capacity will start creating delays of its own that need to be dealt with. This ultimately suggests that managing such a system is an ongoing process that requires constant vigilance and improvement.



Although Alex and Julie have serious marital problems, Julie's apology indicates that simple miscommunication accounts for much of their grief and anger toward each other.



CHAPTER 25

Alex picks Jonah up from the airport once again and brings him to the plant to meet with Stacey, Bob, Ralph, and Lou. Stacey explains that they have new bottlenecks, but Jonah suggests these new delays might not be bottlenecks at all. They go out into the plant and see that the NCX-10 has at least a month's worth of parts waiting to go through it. Talking to a machinist, they gather that since the tagging system prioritizes bottleneck parts, the majority of what the machinists at other machines work on are only the bottleneck parts. Non-bottleneck parts are deprioritized and thus never get processed.

Jonah realizes that he needs to explain more about the nature of bottleneck and non-bottleneck parts. He reminds Alex of his earlier statement that a busy plant is not necessarily an efficient or optimized plant. Drawing a diagram on the floor, Jonah demonstrates that in a system with bottlenecks, if all the non-bottleneck machines keep running all the time just to appear efficient, the plant inevitably runs into excesses of some parts and shortages of others. This creates excess inventory and thus reduces the plant's throughput.

Although Bob argues for keeping their efficiencies high, Alex thinks about their warehouses of excess inventory and realizes Jonah is right. Letting some non-bottleneck machines or workers stand idle is less counterproductive than forcing everyone to work, but creating inventory problems and wasting money. Ralph summarizes the point, saying, "making an employee work and profiting from that work are two different things." They need to work within the "constraints" of the system, rather than try to override them.

Jonah states that by creating more parts than the system can turn into products, they are turning some machines into unnecessary bottlenecks. Instead, they should aim to "utilize" each machine or resource—producing exactly the amount that the system can take all the way through the manufacturing process and turn into sellable product, or throughput. As they walk back to the conference room, Jonah tells Alex and his staff to consider how they will solve their problem as they walk back to the conference room.

The plant's new delays result from over-prioritizing bottlenecks at the expense of everything else. This suggests that although a manager needs to focus on the bottlenecks and maximize their capacity, they cannot neglect rest of the system either. By tagging bottleneck parts as more important than any other parts, Alex and his staff unwittingly halt production on all the pieces that do not need to be processed by a bottleneck.



Jonah's observations imply that although Alex allows for idle workers on the bottleneck machines, the rest of his factory is still operating according to traditional ideas of efficiency, doing unnecessary work in order to keep busy. Again, Jonah's observations imply that individual efficiency is not the same as optimizing the entire system.



Ralph and Alex's realizations suggest that, ironically, busy workers may be less productive than idle workers, since their busyness may burden the system as a whole. Ralph's statement implies that only by working within the system's constraints can they ensure that all work an employee performs is productive and profitable and encourages their overall goal.



Jonah effectively argues against any unnecessary work whatsoever, even if that work creates spare inventory that may be used later. Within his metrics of throughput, inventory, and operating expense, excess inventory represents money that is trapped in the system rather than existing as cash, and it thus decreases throughput.



CHAPTER 26

In the evening, Alex sits at his dining room table at home, trying to work out how to keep the entire manufacturing system working at an even pace. Sharon asks him what he's working on, and when he explains it to her, she asks if she can help. Alex agrees, and Dave decides to join them. Thinking back to the **hikers**, Alex asks how they would keep the whole group hiking at the same speed.

Sharon suggests that to help the whole line keep the same pace, they could make Herbie, the slowest, a drummer to whom everyone marches in time. Dave suggests they tie a rope to everyone to stop anyone from falling ahead or behind. Alex realizes that the rope wouldn't even need to be tied to everyone, just to the people at the front and back of the line. Alex is so proud of them that he tells them they can have whatever they want, suggesting pizza or a movie. Sharon tells him that they just want their mom back.

After putting the kids to bed, Alex thinks about Julie and the ongoing challenges at the plant. They will try to regulate the speed of their system, just like Sharon and Dave suggested, but using computers and data instead of ropes and drums. Alex thinks back to their conversation in the conference room that afternoon with Jonah.

Alex and his staff need to know when to allow more raw material into their system without it becoming clogged. Ralph states that with his new data from the bottlenecks, he can now predict how long it takes any part to go from the beginning of its process to emerging from the bottleneck machines—two weeks. Jonah adds that with this, they can let the bottleneck machines regulate the pace of the entire system, like Alex had initially hoped to do. Ralph says he'll prototype a new data system to make this work, and Alex drives Jonah to the airport to catch his flight.

The next morning, Bob raises the point that even if this new plan works, they'll have lots of people standing idle throughout the day, which seems like a waste of money. Stacey points out that since employees are on payroll, they don't cost any more money whether they are working or just standing there. Alex decides that they will go ahead with the plan anyway, even though Peach won't like their individual worker and machine efficiencies in the monthly report. If they can't make their plant's throughput higher, they'll lose their plant anyway.

Alex sharing his challenges at work with his children represents a positive step in their relationship, since at least he is spending time with them. However, his relationship with them still completely revolves around his own concerns—he never asks them what they are interested in or what they feel, nor does he set work aside to simply enjoy his time with them. This indicates that despite the positive steps Alex has taken, his work still takes precedence over his family.



Alex's promise that his children can have whatever they want for solving a work problem echoes the way that he would reward a particularly innovative employee, revealing how much his corporate career shapes his relationship with his family. However, Sharon's insistence that they only want Julie back reveals that she and her brother care more about family than rewards or their father's career.



Again, although it is good that Alex is sharing more of his time with his children, even that time revolves exclusively around his work, demonstrating that corporate life can cause one to become so single-minded that their relationship to their family is entirely shaped around the needs of their career.



Alex and his staff's struggle to pace their system results in all manner of delays. This indicates that managing the pace of a constrained system is one of the most critical aspects of maintaining a productive flow and increasing throughput. Ralph's ability to predict their pace demonstrates the utility of gathering good data, since it helps one to clearly understand the workings of their system.



Stacey's point attacks the traditional assumption that when a worker is idle, they are wasting their employer's money. This counterintuitive attitude toward idle workers and efficiencies again shows that Goldratt's Theory of Constraints subverts traditional ideas about manufacturing and managing complex systems, making it a revolutionary approach to business.



CHAPTER 27

At the monthly plant managers' meeting with Bill Peach, Ethan Frost reports that Alex's plant has had its first profitable month in years, better than any of the other plants, but it's still not financially stable. Hilton Smyth resents Alex's success, and Peach seems only mildly impressed. Alex gives his own report of their efforts: inventory is down, throughput is up now that they can ship products much faster, and even their efficiencies have stayed acceptable due to the higher shipping rates. Alex is disappointed that Peach isn't more congratulatory but knows that he'll have to wait to explain the full extent of their new ideas. Peach doesn't trust new ideas anymore and still hasn't decided whether or not to close the plant. Plus, Hilton Smyth seems to be influencing Peach a great deal.

Alex meets with Peach after the meeting, and Peach tells him that despite their good month, he wants to see a 15-percent improvement in the next month before he'll commit to keeping the plant open. Alex says that his plant can achieve that, which stuns Peach, and leaves. On the way home, Alex considers what he's just promised—a 15-percent increase would be a phenomenal month and may demand more sales than they can actually make.

Rather than go straight back to the plant, Alex decides to stop at Julie's parents' house. Alex and Julie go for a walk in a nearby park. At first, they talk about how nice it is to spend time together again. However, Julie asks if Alex is going to act differently from now on, or if his work will still always come first. They argue about what the purpose of their marriage is: Julie thinks there is no purpose because the marriage is just two committed people who love each other. They realize that Julie expects a life where Alex comes home at a reasonable hour, whereas Alex expects a life where he puts his business first, like his own father did. They fight for a time and walk back silently. Alex is about to drive home when Julie apologizes and they briefly make up.

Peach's reticence to congratulate Alex or recognize his early success suggests that he is entrenched in traditional ideas about business, implying that adherence to tradition often discourages leadership from considering new processes and methods. Hilton Smyth's personal resentment toward Alex and apparent influence over Peach further suggests that interpersonal politics and posturing also can impede new ideas, since one's competitors may not want to see them succeed.



Peach's demand for 15-percent growth appears unreasonable, suggesting that, for whatever reason, he wants to see Alex fail. Because Hilton Smyth resents Alex and seems to influence Peach, it seems probable that Smyth is angling Peach against Alex due to personal vendetta, demonstrating the pettiness of corporate politics.



Alex and Julie's argument reveals that they clearly have different goals for what their marriage should look like. Once again, Alex's marital problems parallel his problems at the plant. Just as his lack of a clear goal for the plant led to disorganization and chaos, so do his and Julie's lack of a clear goal for their marriage results in differing—and thus, unmet—expectations about how the other should behave, leading to anger, disappointment, and more fights.



CHAPTER 28

Alex gets home in the evening, just as Jonah calls from Singapore to check on their progress. Alex tells Jonah that everything is going well, but that Peach laid down a new ultimatum. Jonah thinks matching Peach’s demand is entirely feasible, though it is time for Alex to take the “next logical step.” The next morning, Alex meets with Stacey and tells her Jonah says they need to cut their batch sizes in half. Stacey realizes that that would cut their in-process inventory in half, though it would require twice as many machine setups and a lot of negotiating with material vendors to deliver twice as often. Alex promises her that it will be worth it, because there is a hidden benefit.

While meeting at a restaurant, Alex relays Jonah’s new advice to his staff. Jonah claims that any part’s time in the system involves four stages: setup time, while the part waits for the necessary machine to be set up; process time, while a machine is actually working on a part; queue time, while the part is waiting to be fed into a machine while that machine works on something else; and wait time, while the part waits for the other parts it will be assembled with into the final product. The majority of each part’s time in the manufacturing process is queue and wait time.

Although the plant uses a traditional economical batch quantity (EQB) formula to determine batch size, Jonah advises that by cutting the batch size in half, the plant can reduce each part’s queue and wait time in half as well. This means that cutting the batch size in half also cuts inventory roughly in half, and the increased speed means that their plant can deliver products faster than their competitors can, leading to more sales and more throughput. Bob worries about increased setup time, but Alex reminds him that since this mostly happens at non-bottleneck machines, they have idle time to burn anyway. Thinking about this, Bob estimates they can reduce the time it takes to fulfill an order from two months down to three or four weeks. Alex decides he’ll tell marketing to promise four-week deliveries to new clients.

Alex drives to UniCo headquarters to meet with Johnny Jons and convince him to promise four-week deliveries to generate more sales. Jons is skeptical, since orders used to take Alex’s plant six months to execute. Alex promises Jons that he can do it and says that if they promise it and don’t deliver, he’ll buy Jons a new pair of Gucci loafers. Jons compromises and says he’ll advertise six-week deliveries—and if Alex delivers any orders in less than five weeks, Jons will buy Alex a new pair of shoes instead.

Jonah’s confidence that Alex can meet Peach’s demand suggests that he, and thus Goldratt, have a tremendous amount of confidence in the Theory of Constraints and its ability to revolutionize businesses and grow profits. Stacey’s observation that cutting batch size in half would also reduce their in-process inventory implies that the plant would have more cash available at any one time, since less of it would be trapped in the system as inventory.



Jonah’s claim that most of a part’s time in the system is queue and wait time implies that parts spend the majority of their manufacturing journey sitting idle, waiting for their turn in the machine. This implies that if Alex and his staff can reduce that queue and wait time, they can vastly increase the rate at which they manufacture parts and build finished products, which will increase throughput.



Jonah’s point that offering faster delivery times results in more sales provides yet another benefit of Goldratt’s Theory of Constraints. By increasing speed, not only can the plant produce and sell more products faster, but it can also provide a better service to clients. Additionally, the plant’s flexibility to accommodate more setup time only results from allowing workers to stand idle at non-bottleneck machines, demonstrating that such idleness actually allows for greater flexibility within a complex system.



Johnny Jons’s skepticism that Alex can improve his delivery time from six months to only four weeks seems merited, but it also underscores the massive improvement that Goldratt believes his Theory of Constraints can create.



CHAPTER 29

In their house in Bearington, Alex lies awake next to Julie, who is sleeping. It's four a.m., but Alex can't stop thinking about the plant. Johnny Jons won them a host of new contracts, and the decreased batch sizes have sped the entire plant's manufacturing process up. Although there is still some idle time for non-bottlenecks, the smaller batch sizes make everything move quicker, providing all workers and machines with more consistent work to do. Inventory is lower than ever. But there is also bad news, and Alex climbs out of bed to think about it. Julie approaches him from behind and asks him to come back to bed.

Alex tells Julie that he can't sleep, and she intuits that it is because of his work. When she asks Alex to tell her about it, Alex is surprised that she would be interested, but he begins to explain: although their actual expenses haven't gone up at all, because more people handle each part more often, the way that corporate headquarters wants them to do their accounting makes it appear as if their cost-per-part is swelling. The traditional metric assumes that all workers will always be fully occupied and to handle more parts they have to hire more people, but this isn't true for Alex's new system. Rather than dwelling on this, though, Alex opts to take Julie out for breakfast.

At the plant, Lou tells Alex that he's found a new way to calculate cost-per-part that doesn't make their expenses appear artificially inflated. However, it breaks with traditional corporate accounting rules, and Lou knows that Ethan Frost would never allow it if he knew about it. Alex and Lou agree to use Lou's new method and hope that Frost doesn't notice. Shortly after, Johnny Jons calls Alex and tells him that Bucky Burnside wants to buy from them again, but they appear to be desperate—they're asking for 1,000 products made and shipped in two weeks. Jons tells Alex that it seems nearly impossible, but if Alex can pull it off, Burnside will make their plant his preferred supplier. Alex tells him he'll call back this afternoon with an answer.

Alex meets with Bob, Ralph, and Stacey to discuss Burnside's order. Alex wonders if they could cut their batch size in half again, if that would save them the time they need. However, Stacey realizes that a control module they need is currently out of stock and must be shipped from California, and the provider can't deliver them for four to six weeks. After negotiating early partial shipments with the control module supplier, Alex calls Johnny Jons back and tells him that they could ship Burnside 250 products per week for four weeks, with the first rolling out in two weeks. Jons thinks Burnside might accept, though he thinks that it still sounds like a hard order to fill.

Once again, the fact that Alex is awake and thinking about work rather than sleeping with his wife—especially when they spend so little time together—demonstrates Alex's corporate career's cost to his personal wellbeing and relationship with Julie. However, the increased productivity at the plant suggests that Jonah's decreased batch sizes are effective, allowing the plant to generate more throughput and have even less money trapped in inventory.



Alex wrongly assumes that Julie wouldn't have any interest in his work problems—she does want to know about what consumes so much of his life. This suggests that some of their marital strife could have been avoided if Alex had been more willing to share his feelings and fears with Julie. Alex's struggle with traditional metrics suggests that such dated metrics often provide an inaccurate picture of what is truly occurring within a business.



The fact that Lou must develop his own accounting method and hide it from Ethan Frost again suggests that traditional corporate metrics are deeply flawed and don't accurately describe a business's overall health. However, Lou's ability to develop and use his own accounting method that does provide a clearer picture implies that better metrics and accounting systems are possible, if corporate leadership will allow people like Lou to invent them. Burnside's seemingly impossible order gives Alex the chance to test the limits of their new system.



Alex's ability to predict their own capacities and offer a compromise deal to Burnside likely wouldn't have been possible with their old system, since they struggled to ship anything on time or estimate how quickly something could be produced. This ability to predict demonstrates another advantage of a steadily-paced, organized manufacturing system, which only appears possible within Goldratt's Theory of Constraints.



CHAPTER 30

At the start of the new month, Alex and his staff have their monthly report. Lou reports that they had a 17-percent improvement thanks to Burnside's order, which meets Peach's demand. The plant is turning a firm profit and has made up for its former losses. The next day, Alex receives notice from Peach that he will soon have a formal performance review of his plant. Alex looks forward to showing what he has done. However, Alex's enthusiasm wanes the next week when Hilton Smyth drops by unexpectedly while Alex is away at a meeting. Smyth notices that some machines are idle and starts grilling Bob and the others about their new processes.

Ethan Frost calls Alex, having just heard from Smyth, with questions about their new accounting methods. He sends an auditor named Neil Cravitz who doesn't like the new methods, even though Alex insists that it gives a more accurate representation of their expenses. Lou receives a warning from Frost to stick to the traditional measures, but other than that, neither Alex nor Lou receive any formal punishment. However, using the old accounting methods, their monthly progress isn't 17 percent, but only 12.8 percent—less than Peach demanded.

While Lou and Alex are meeting about the revised numbers, they hear a helicopter land in the parking lot. Johnny Jons and Bucky Burnside climb out. Alex panics, assuming something went wrong with his order. Before Alex can intercept them, Burnside strides into the plant and shakes hands with every employee he can find. Burnside congratulates Alex on their incredible work with his difficult order and states that he wanted to personally thank every person in the plant for pushing to get it done. Johnny Jons pulls Alex aside and tells him that he's about to finalize a long-term contract with Burnside's company to sell them 10,000 units a year. Alex is floored.

Since Alex must be at corporate headquarters in the morning, he decides to spend the night with Julie at her parent's house, which is closer than his own house. When he arrives, he and Julie take another walk together. Alex shares how nervous he is about his performance review, since the traditional accounting method makes their number look less impressive than they actually are. Julie tells Alex that she enjoys hearing about his work, and she wishes he'd told her more about it over the years. They both admit to getting too wrapped up in their own lives instead of thinking about the other's feelings.

More than Peach, Hilton Smyth represents the folly of strict adherence to traditional methods and efficiency metrics. Even though Alex's plant is far more profitable than it's ever been, Hilton Smyth sees the idle machines as a sure sign that Alex and his staff are wasting money, suggesting that he trusts more in traditional metrics than in the proven productivity he can see with his own eyes. That is, Smyth's adherence to traditional ideas makes him irrational.



Even though Ethan Frost chastises Lou for breaking away from traditional cost accounting metrics, the fact that neither Alex nor Lou receive any real punishment suggests that Frost recognizes that Alex's plant is profitable, regardless of how they measure it. However, those traditional metrics cause Alex's plant to appear to underperform, which could cause Peach to close the plant, demonstrating that faulty metrics can have serious ramifications.



Johnny Jons and Bucky Burnside's praise affirms that Alex's plant is succeeding. The plant is satisfying customers and making huge sales, thus achieving their goal of making money despite what the traditional accounting method reports. This validates Jonah's advice and again suggests that traditional corporate accounting measures do not give an accurate description of a business's success.



Although Alex and Julie do not overtly state the goal of their marriage, their mutual admission that they've been too involved in their own lives to think about each other suggests that they've agreed upon an implicit goal: spending time together and sharing in each other's lives. Alex's fear about his performance review, which will be less impressive by traditional metrics, again demonstrates that faulty metrics can potentially cost someone their job, making it appear that they are failing even when they are achieving their goals.



Julie confesses that she's nervous about moving back home, because she doesn't want Alex to stop paying attention to her like he does now. But she also knows that Dave and Sharon need their mom and dad at home; raising them and being together seem like good goals. Alex and Julie agree to make a point of sharing their lives with each other more, as often as they can. Alex says that the late nights won't stop, but he'll try to pay extra attention to Julie and the kids. Alex jokingly asks Julie if she wants to get married again, and they decide that they'll go to Vegas and have a shotgun wedding that weekend.

In Alex and Julie's marriage, just as in business operations, having clear goals allows them to see where they are succeeding and where they are failing. Though Alex once failed to recognize what he was doing wrong by working all the time, having the goal of spending time with Julie and sharing his life with her helps him to realize when he is failing to achieve that goal. This shows the usefulness of goals in both career and personal matters.



CHAPTER 31

Alex arrives at headquarters to find that only Hilton Smyth and Neil Cravitz will be conducting his performance review—Bill Peach and Ethan Frost are elsewhere. Smyth tells Alex that he'll decide whether to close the plant and that Alex has a lot of explaining to do regarding his increased costs-of-products. Alex is angry that Peach and Frost aren't there but begins his presentation.

Hilton Smyth's obvious vendetta against Alex demonstrates the pettiness that can pervade corporate decisions. Additionally, his adherence to traditional metrics prevents Smyth from recognizing how successful Alex's plant truly is, suggesting that faulty metrics can make honest evaluation impossible.



When Alex states that UniCo's goal isn't to keep costs down but to make money, Cravitz immediately agrees with him. Smyth looks skeptical, but Alex makes his case for the next hour and a half. Smyth thinks that Alex hasn't done anything revolutionary, and when Alex outlines the new ideas he's taken from Jonah, Smyth refuses to see their merit. At the end of the meeting, he shouts that Alex's cost-of-products increased, which must mean that the plant is still losing money—that's what he'll base his recommendation to Peach on. Smyth ends the meeting.

Smyth wants to close Alex's plant, even though it is the only plant making money in the whole division. Hilton Smyth's refusal to listen to Alex's logic—even though it clearly makes sense to Neil Cravitz, an accountant—indicates that he is motivated more by his personal hostility toward Alex, his rival, than he is by helping UniCo become a profitable company again.



Alex leaves the meeting but feels he must speak with Peach himself. He strides into Peach's office, and the secretary tells Alex that Peach is already waiting for him. When Alex tells Peach that Smyth's bad report on his plant is completely wrong, Peach calls Smyth, Ethan Frost, and Johnny Jons in to join them. Smyth states his opinion that Alex's plant is wasteful and will lose money, but Frost and Jons defend Alex's plant as being the most productive in the entire division. Peach announces that he, Frost, and Jons are all moving up the corporate ladder in two months. Peach declares that not only will they not close Alex's plant, but Alex will advance into Peach's current role of managing the entire division.

Alex's sudden promotion again validates the efforts he's made to reform his manufacturing plant and adopt Jonah's new ideas. Peach's decision to keep the plant open resolves the primary arc of the story and implies that not only does he see that Alex has managed to turn his plant around, but he believes Alex could reform the entire division of failing plants and make them profitable again. Alex's victory over Smyth suggests that good performance will garner more praise and promotion than mere posturing.



Peach recommends that Alex spend the next two months preparing for his new role. Alex returns to the plant to announce the great news. Before he does, however, he calls Jonah, who congratulates Alex on his success but refuses to provide any more help until Alex does some learning on his own. He asks Alex what he wants to learn the most, and Alex answers that he wants to learn to manage any organization of any size and perhaps learn to manage his personal life at the same time. Jonah tells Alex that his first assignment is to determine what techniques are critical to effective management.

CHAPTER 32

Alex and Julie celebrate the promotion over dinner, but Alex can tell that Julie is forcing her enthusiasm. He wonders aloud whether the promotion is just “winning a point in the rat race” and says that their family suffered too much for it. Julie reassures him that they would have had problems even without the crisis at the plant. Alex decides they should toast the promotion not as another step up the ladder, but as a “positive reassurance to our exciting, worthwhile journey.” He starts to wonder if he can celebrate it at all, since it was all Jonah’s doing, but Julie wisely cuts him off.

Julie asks Alex why they didn’t come up with Jonah’s solutions on their own, since they all seem simple enough. Alex reflects that they are all common sense ideas, but they go against traditional business wisdom. He also reflects that Jonah used a “Socratic approach” by asking questions and forcing Alex and his staff to reach most of the conclusions themselves. To Alex, it seems more effective than simply telling someone the answers, since, like Hilton Smyth, that person might simply refuse to agree. Julie points out that only asking questions is irritating and off-putting as well. Alex decides that the technique he needs Jonah to teach him is how to persuade other people. He wonders how a physicist understands manufacturing systems so well, and Julie advises that he ask Jonah that, too.

Alex’s desire to learn how to manage any organization of any size suggests that the same general principles apply to any scale of organization. Furthermore, Alex’s prioritization of his personal life not only suggests that he recognizes his failures as a husband and father, but also that he recognizes the parallels between his struggle to manage the plant and his struggle manage his familial relationships.



Alex’s admission that he’s won just one more “point in the rat race” suggests that part of him feels his corporate career is meaningless. This seems to be a rare moment of honesty about the fact that pursuing a corporate career can have a tremendously negative impact on one’s health and family. Moreover, even when Alex suddenly declares his career to be a “worthwhile journey,” he never answers what makes it worthwhile in the first place. This leaves open the question of whether such a career is worthwhile considering the costs.



Jonah shares Goldratt’s own belief—which he outlines in the novel’s introduction—that asking questions and pushing someone to reach conclusions on their own is a more effective method of teaching than relaying information through a lecture or manual. Alex’s conclusions about Jonah’s teaching methods also reveal why Goldratt chose to convey his Theory of Constraints through this story, rather than simply writing them out as a short technical book.



CHAPTER 33

Alex approaches Lou, intending to recruit him to division management as part of his team. Before Lou can offer the new job, he tells Alex that the plant will achieve an estimated 20-percent profit improvements for the next two months. However, Lou has discovered another serious flaw in UniCo's traditional accounting system. Currently, although excess inventory is a liability, their methods count inventory as positive assets. Thus, when the plant reduced its inventory, what was actually a good sign appeared to be a bad sign. Lou states that he's already explained it to Ethan Frost, which was part of why Frost was so supportive of Alex's claims. Before Alex can even offer Lou the job, Lou tells him that he wants to keep reforming UniCo's accounting methods. He wants Alex to make him his division controller, and Alex agrees.

Next, Alex offers Bob a job on his new division staff. Bob flatly refuses. He tells Alex that after Burnside visited the plant, he realized how integral good production can be to sales and client relationships. Rather than oversee production for the entire division, Bob wants to master plant-level production systems and understand how to scale and adapt them. To continue rethinking old processes, Bob wants to be the plant manager once Alex leaves. Alex agrees, so long as Bob will consider moving up to the division level if he ever feels he's mastered plant production and management. However, they are not sure who will replace Bob in his current role.

They call Stacey and Ralph in. Stacey states that she wants to take over Bob's role as production manager. She recently discovered that, although the bottlenecks are taken care of, a secondary problem arises with what she calls "capacity constraint resources" (CCRs), machines that fall behind only if sales increase at a rapid pace. Stacey wants to become production manager so that she can build and implement new measures to protect the manufacturing system from derailing due to newly arisen CCRs.

Ralph feels he's contributed more in the past few months to solving real problems than ever before. Now, he wants to develop a newer, better data system that can help deliver answers to specific questions, like the ones that Bob or Stacey or Lou will have as they design their new ideas.

Lou's desire to keep developing suggests that although Jonah proposed three effective metrics, even those measurements need to be continually improved upon. As the nature of business and manufacturing continue to change, people like Lou must continue refining them and searching for flaws, ensuring that they are well-suited to the task at hand. Lou's satisfaction in doing this sort of work suggests that finding better metrics is a valuable and essential pursuit. Significantly, Lou has a clear goal for his endeavor.



Like Lou, Bob's desire to continue innovating and refining manufacturing plant production suggests that, despite Jonah's effective strategies, there will always be more to improve upon. Through Bob's decision, Goldratt effectively argues that even his Theory of Constraints should be reexamined and modified—productive as his theory is, someone else can always improve upon it. Like Lou, Bob has a clear goal for what he wants to achieve.



Although capacity constraint resources are introduced in the novel like another business term, Stacey will soon discover how to solve them, making them a negligible part of Goldratt's overall theory. Even so, her observation provides a warning for managers to be watchful for new constraints, even when they have handled the initial bottlenecks.



Although Ralph's data management is less explored than the other character's concerns, his sense that he's helped solve important problems suggests that good data gathering and utilization are essential for overcoming complex obstacles.



CHAPTER 34

Alex and Julie drink tea together in the evening and talk about their days. Alex shares all of his staff's new plans and ideas and thinks that each of them could be critically important. Julie points out that for them to have the freedom to follow their passions, Alex will need to run the division smoothly; perhaps they should spend the next two months helping him prepare. Alex thinks that Julie is his "true advisor."

At the plant, Alex gathers his staff and explains that he needs their help preparing to be an effective division manager. He asks what they think the first thing he should do in his new role is, and everyone agrees that first he must gather information and determine what people in the division think their primary problems are. Alex points out that he will likely wind up with an overwhelming amount of information and asks how they should organize it. To demonstrate, he draws numerous colored shapes on the whiteboard and asks his staff how they would organize them. They bicker over whether to organize the shapes by color, size, shape, and so on until Alex realizes that they have no idea how he should organize complex information. He adjourns the meeting for the day.

CHAPTER 35

The next day, Alex asks his staff if anyone has come up with a better way to organize information. Ralph explains that when he formerly studied chemistry, he learned about Dmitri Mendeleev, who came up with the periodic table of elements. Mendeleev's system endured because it ordered the elements according to their weight, size, and behavior, and thus it could even predict the characteristics of other elements that weren't yet discovered based on where they would sit in the periodic table.

Although Bob is skeptical of Ralph's story, everyone else thinks Ralph is on to something. Ralph states that Mendeleev's organization system revealed an "intrinsic order" of the elements, and if they can find an "intrinsic order" to organize events in the division, they can make real progress. Alex realizes that they are trying to make management into a science, just like Jonah is a scientist. At home, Julie tells Alex that she started reading Plato's Socratic dialogues, since maybe it will help her learn to persuade her husband and children.

Alex and Julie take time to share their thoughts on the day, which represents a positive step toward achieving their goal of sharing in each other's lives. Their healed relationship demonstrates the effectiveness of having goals even in personal relationships.



Alex's plant's survival resolves the novel's primary tension and demonstrates the effectiveness of working within Goldratt's Theory of Constraints in a manufacturing setting. The remaining chapters pivot to describe Alex's preparation to take over his division, demonstrating the Theory of Constraints' scientific approach and key principles can be applied not just in manufacturing, but in all variety of management problems.



Ralph's description of Mendeleev and Jonah's former career as a physicist both reinforce Goldratt's conviction that business should be approached as a science; essentially, businesspeople should adopt a scientists' approach of looking for relationships between phenomena.



Ralph's belief that an intrinsic order exists to any set of data suggests that if a manager can find the underlying relationships present in any complex problem—like Mendeleev found the relationship between an element's weight, size, and behavior—that problem and all its data points will begin to organize itself. A manager will even be able to predict data that they do not yet have.



CHAPTER 36

The next day, Bob and Stacey spend the morning dealing with new problems in their production line, and Alex privately wonders if everything will fall apart again. Once they begin their meeting, they realize that they need to set a new goal for themselves as managers, both over the division and the plant. Lou proposes that they make their new goal to create a “process of ongoing improvement.”

Bob initially thinks that the phrase sounds like corporate jargon, but Lou points out that they have made improvements thus far by measuring every idea’s effect on throughput, rather than trying to reduce meaningless expenses as most people do. That is what made their work over the last few months successful. Rather than thinking of expenses as the most important function, they prioritized throughput, then inventory, and considered operating expense as the least important measurement. Alex considers Lou’s observation critically important and reflects that it represents a shift in the basic culture of the business, though he wonders how he can spread that to the entire division.

Bob still feels that they’re missing something, that the improvements they created were different in more ways than just the measurements they used. After thinking awhile, he excitedly exclaims that the word “process” is critical. Not only did they come up with new ideas, but they implemented them as a process of steps. They decide to write their process out: Step 1: “Identify the system’s bottlenecks.” Step 2: “Decide how to exploit the bottlenecks.” Step 3: “Subordinate everything to the above decision,” by matching the whole system to the pace of the bottlenecks. Step 4: “Elevate the system’s bottlenecks” by finding ways to increase their capacity. Step 5: “If, in a previous step, a bottleneck has been broken, go back to Step 1.” Written out, Alex thinks that it all seems simple. Stacey advises replacing “bottleneck” with “constraint.”

At home with Julie, Alex feels both elated and nervous. He isn’t sure how to increase throughput anymore without taking on so many sales that it derails the plant’s natural flow. Julie suggests he let Bob worry about the plant now, since he will soon take charge, and Alex realizes she is right.

Alex’s staff’s need for a new goal suggests that goals may change as one achieves their initial ambition. Just as Lou and Bob’s career goals suggest that new people should iterate and improve on metrics and production systems, Lou’s proposed goal implies that even Goldratt’s revolutionary ideas will need improvement and refinement.



Lou’s reflection implies that businesspeople should focus on increasing their net profits rather than stressing about minimizing their expenses, as the novel suggests that most do. Lou offers an order of importance to the three metrics and believes that focusing on throughput rather than operating expense was the key to their success, indicating that Goldratt’s Theory of Constraints will only work when a manager prioritizes net profit over additional costs.



Bob’s claim that their improvement succeeded because it was a process reinforces the novel’s earlier suggestions that every process requires constant iteration and improvement. The five steps offer the novel’s most concrete instructions on how to perform that process. Notably, Step 5 loops back to Step 1, indicating the process will be a continual cycle of testing, improving, re-testing, and making new improvements. That is, managing a complex system is an ongoing endeavor.



When Alex is finally willing to share his life and his work with Julie, Julie turns out to be a wealth of good advice, suggesting that she could have helped him earlier if he had been willing to listen and accommodate her needs in return.



CHAPTER 37

At the plant, Ralph raises the concern that something about their process still feels off. Even when the constraints were changed and their capacity increased, it did not seem to affect the non-constraints, even though it theoretically should have. Stacey realizes that with the red and green tagging system still in place, the bottlenecks were still operating like bottlenecks when they no longer needed to. She surmises that if they remove the tagging system, the natural flow of the manufacturing system should self-correct and might even resolve her Capacity Constraint Resources problem.

Bob points out that they are shipping so far ahead of schedule now that the market is more of a bottleneck than the NCX-10 and heat-treating machines—they are limited by their sales. Lou agrees but wonder why the NCX-10 is still working at capacity. Stacey admits that to keep the bottleneck machines operating at full capacity, she ordered a few extra units to be assembled and stocked on shelves. She estimates they have roughly six weeks' more inventory than they require. She adds a warning to Step 5 of their process: "do not allow INERTIA to become a system's constraint."

Everyone is satisfied except for Lou, who realizes that with this new process, every metric they've used to measure progress (including cost accounting) needs to be completely reexamined. However, Alex is excited: with the 20 percent excess capacity that Stacey artificially filled, he thinks he can leverage that free capacity to "really take the market." He wants Lou and Ralph to go to headquarters with him tomorrow morning to talk to Johnny Jons.

CHAPTER 38

Alex picks Ralph and Lou up early in the morning and drives to headquarters, calculating in his head how he will make his appeal. When they meet Johnny Jons, Jons introduces them to Dick Pashky, his best marketer. Alex explains that he has 20 percent more capacity in his plant and wants 20 percent more sales—10 million dollars' worth. Johnny Jons laughs at him and explains he's already making all the sales that he possibly can. He does have French clients who want to buy from them, but the prices they are asking for is far too low.

Again, the fact that Alex and his staff are still improving upon their own system, even after the main story arc has ended, suggests that any complex system requires constant attention and development. Stacey's decision to remove the tagging system suggests that once a system is optimized and flows according to its constraints, it may no longer need the organizing and support systems that were initially necessary.



Stacey's decision to order the bottlenecks to make unnecessary products in order to keep them at full capacity echoes the plant's former practice of trying to keep everyone busy and thus efficient at all time. Even within a new and undeniably better system, old habits die hard.



Since Stacey created unnecessary work, as soon as the plant stops producing that work, they will have more capacity than they can actually use. This new capacity allows Alex to push their new manufacturing system even further and to test its limits. Alex's desire to always increase profits, even when the plant is not in crisis, suggests that his work is an ongoing obsession.



Alex's final push to make more sales from a market that Jons believes is already exhausted demonstrates how a manufacturer, running a newly-optimized system, can use their new increased capacity to offer lower prices. This can allow them to take hold of a larger portion of their target market or even to break into an untapped market.



Alex and Lou think a moment, then tell Jons they can produce products for the French at 10 percent less than their production costs. Jons doesn't understand how it could work but tells Dick to bring the paperwork—he'll hear Alex and Lou out. After spending several hours calculating costs, Alex tells Jons that he wants to use this deal to break into the European market. On top of the price, he says Jons should guarantee that they'll deliver their products within three weeks. Jons thinks they're crazy, but when they prove their math, he agrees. On the way home, Lou calculates that the plant will make a seven-figure profit. They are all thrilled. Despite his excitement, Alex still feels that he has so much to learn if he is going to run the entire division.

Alex remembers Julie's point that Jonah is a scientist and Ralph's mention of Mendeleev. He wonders again if there isn't some hidden connection between science and business. At the plant, everyone is busy preparing for the French contract except for him. Now that things are running smoothly, he has nothing to do. He misses the activity, the sense of being needed. With nothing better to do, Alex decides to go to the library and read some science books, starting with Newton, to see if there is anything to learn.

That evening, Alex and Julie drink tea together and Julie tells him more about Socrates. Alex tells her about the physics books he read, which didn't relate directly to business but revealed something about the way scientists operate: rather than collecting massive amounts of data, scientists look for simple if-then relationships between phenomena and slowly piece together all of the interconnections in the material world. Julie remarks that this is like how Socrates studies human behavior. Alex guesses that this is also how Jonah develops his ideas—by using this “thinking process” to find unusual relationships between things and people. However, Alex is not sure what to do with this realization.

CHAPTER 39

In the morning, Bill Peach calls Alex to ask him to come into headquarters. Hilton Smyth's plant's traditional metrics look good, but he continues to lose money. Ethan Frost is convinced that they need to change their accounting methods, and they want Alex's help. Alex is surprised that Peach is considering changing his traditional metrics, but he agrees to come in.

The plant's increased capacity and optimized system means that they can produce more finished products for less cost. Alex and Lou's pitch to manufacture goods for the French below their current product cost (though not below the cost of materials) again demonstrates how a manager can use the increased capacity of his system to offer a more competitive price, make more sales, and take control of a greater portion of their target market.



Alex misses being busy and constantly being needed, suggesting that part of his obsession with his corporate career is ego-driven; as a manager, he always feels that other people need him and therefore that he is important. This recognition of lurking corporate ego depicts the corporate lifestyle as both thrilling and deeply flawed, even troubling.



Alex's understanding of Jonah's “thinking process,” which parallels Socrates's own “thinking process,” implies that any manager should adopt this scientific mindset to better understand their business. By searching for relationships rather than just collecting data, one can focus entirely on what seems important rather than distract themselves with plentiful but meaningless facts. That is, they can maintain their focus on their goal.



Peach and Frost's desire to find better metrics as well suggests that if one can prove that their new way of measuring is successful (by managing a successful system), even those people steeped in tradition must recognize the usefulness of new metrics.



Alex's excitement is tempered when Stacey and Bob approach him with bad news: new bottlenecks are appearing and throwing off the flow. Workers are running into overtime trying to correct the process, but it looks like the plant is about to miss several deadlines. Alex and his staff brainstorm and argue about the causes until Alex and Ralph realize that the new flood of orders has changed the flow of the entire manufacturing process. Their capacity has increased, but the non-bottlenecks have to adjust to compensate the change. Bob springs into action, ordering Stacey to change priorities and declaring that they'll have to work with marketing and adjust their deadlines until this crisis passes. As Alex watches Bob direct, he realizes that "the baton has been passed," and he feels both "proud and jealous."

Lou and Alex chat in Alex's office. Lou is impressed with Bob's new leadership, but Alex is worried. Overtime will go up and they'll have to break their promises about fast deliveries to marketing, and Alex thinks something must have gone wrong somewhere. He senses that they are reacting rather than planning ahead, but Lou still sees it as progress.

CHAPTER 40

Lou and Alex drive home from headquarters together, as they have every day for the last two weeks. Each day, they've been meeting with Peach to get a true idea of how poorly the division is performing and, other than Bob Donovan's plant, how at-risk every plant is. Alex and Lou bicker.

Alex fears that all they are doing is collecting data, but Lou insists data collection is not inherently bad. The problem is that their measurements are still bad—plants have been making products but never selling them yet still counting them as income rather than inventory. No one is considering their actual throughput, and people are reticent to accept new metrics, since that would expose their poor performance and reveal that they are not making money but losing it. Lou wants to see if their five-step process can help with these problems too, but Alex tells him he has plans for the evening.

Later, Lou and Alex meet to analyze their issues: Lou believes that bad metrics are the division's chief constraints, but Alex is unconvinced. He thinks some more basic principle is at work. They continue to bicker and grouse about corporate issues like selfishness and greed. Lou remarks that the plant's process had physical bottlenecks, but the organization's bottlenecks might not be so concrete. Their five-step process still appears legitimate, so long as they can determine their new constraints or "core problem."

Although the plant runs according to its constraints and appears well-optimized, the new crisis again indicates that managing such a complex system requires constant vigilance and critical thinking. This final obstacle in the plant is significant primarily because it pushes Bob to take action as a leader. As Alex recognizes, this moment signals the transition of leadership and responsibility for the plant from Alex to Bob, allowing Alex to step away and step into his new role as division manager.



Although Alex is no longer responsible for the plant, his continued concern suggests that he will always be looking to refine their process and make it more effective and more adaptive to change.



Alex and Lou's realization of how dismally the division performs implies that they have plenty of work ahead of them to turn the division around, as they did for their plant.



Lou's inference that people don't want to use new metrics if they will reveal their own failures suggests that managers' egos may keep them committed to traditional, though failing, metric systems. Though Lou wants to keep working, Alex's statement that he has plans for the evening implies that he will spend the evening with Julie and is thus prioritizing their relationship, even in the midst of his work.



Again, Lou's claim that the division has its own bottlenecks to address and utilize suggests that Goldratt's Theory of Constraints works not only for manufacturing, but for managing any complex, multi-stage system. However, Alex's recognition of interpersonal problems like selfishness and greed suggests that managing at the division level involves solving human behavior problems along with logistical problems.



As they continue debating about constraints and core problems, Alex realizes that they are fundamentally asking “what to change,” “what to change to,” and “how to change.” He realizes that these are the same questions Jonah uses, but now they will have to learn to be “[their] own Jonahs” and figure it out for themselves. Lou puts an arm around Alex and tells Alex that he is proud to work for him.

Alex’s belief that he and Lou must be their “own Jonahs” suggests that despite their promotions and the things they’ve learned, they will continue to learn and grow as managers.





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