TIMBER TEMPO

PROJECT FLOW IN FORESTRY

STEVEN BICK

“Anything that allows your audience to access how you see the world is accurate.”

- Rick Rubin

TIMBER TEMPO

Project Flow in Forestry

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This Book is Dedicated to

Miklos A. J. Gratzer

A master storyteller, forester and educator

Timber Tempo: Project Flow in Forestry

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"Cliff mistakenly thought he had a band, but this lumber company was largely a collection of solo artists."

Overture: A Skanawan Lumber Story

Cliff stood at the edge of the mill yard, breathing in the scents of freshly cut lumber and the crisp Wisconsin autumn air. The hum of the sawmill was a comforting symphony of industry, yet it clashed with the tumult in his mind. Running a sawmill was one thing; managing the people who worked in them was another beast entirely. As the third generation in his family to helm Skanawan Lumber, the weight of his heritage pressed heavily on him. He knew he had a problem to deal with that day and he dreaded it.

The angry sounds of an argument soon reached his ears from the log yard. He knew this was coming and scrambled over towards the source of the noise, surprised only by the heated tones of the discussion. A few yard workers stood nearby to watch, but Cliff shooed them away.

Bill, the manager of the sawmill, was complaining loudly to the head of procurement that the mill would be out of hard maple sawlogs before the shift was over. Logan, the procurement manager, was giving as good as he got, rejecting the blame for this situation and

strongly implying that Bill's reluctance to allow him to increase log prices and maintain a larger inventory was the problem. There was a small fire at the sawmill back in the Fall and ever since then Bill had pushed Logan to maintain a smaller inventory of logs. Logan had countered that buying logs wasn't like ordering a pizza delivery. While tension over this issue was common, it only reached a boiling point when they ran out of logs. It had happened twice this year already and Cliff could tell this morning's flare-up was at a new level.

Cliff wasn't sure if he calmed either man down, but he did separate them. The incident served as a biting reminder of the complexities he faced daily. He had known they could do a better job of procurement, both here at their flagship mill and at the four other mills the company owned. This incident pushed him to move forward with something he knew he should have started a year ago – a formal analysis of their procurement methods with an eye toward doubling down on everything that works, eliminating things that didn't, and adding new methods. It was time for a project.

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Cliff's grandfather had been a stern yet kind man who had survived World War II and returned home to build the first Skanawan sawmill on the current site. Cliff could almost

see him now, barking out orders and directing trucks, workers, and lumber piles with a precision that bordered on obsession. The old man had turned a small operation into a profitable business, seizing opportunities with fierce determination. The second mill in Michigan had been his grandfather's bold move, and his ambition had seen both mills grow to be among the leading lumber producers in the region.

Cliff never felt like he knew his grandfather well, for all the time he had spent around him. At least now he understood how the kind old man who took him fishing could become a demanding despot when it came to stacking lumber. He hated the work as a boy but now saw it as valuable training. His father had taken over the business in the early 1980s, and Cliff joined the company full-time after college. He worked his way up through most of the jobs in the mill, preparing himself for the day he would take over.

Coming out of the Great Recession in 2009, Cliff knew he had to either take control of the company or find work elsewhere. His parents recognized this and handed him the reins. It wasn't an easy time to take over, but he seized on new sales opportunities, especially in export markets for their hardwood lumber. He often wondered what his grandfather would have thought of this.

Under Cliff's leadership, the company regained its footing and soon had cash, expanded credit, and new opportunities. They acquired three family-owned sawmills in the Midwest. All three were mills whose next generation family members weren't interested in taking over. In a five-year period, Skanawan had added mills in Minnesota, Indiana, and Illinois to the mills in Wisconsin and Michigan.

Prior to the acquisitions, Cliff felt himself getting complacent with the two original mills and wanted to grow beyond his comfort zone. The new sawmills solved that problem, but now he had to grow into the job of overseeing a larger operation. It took him a couple of years to realize he was no longer just a mill manager—he was the CEO of a significant enterprise.

Despite consolidating lumber sales through the parent company, day-to-day operations at each mill remained largely independent. This might have worked with a motivated owner at each site, but Cliff realized the company wasn't taking advantage of opportunities to streamline methods and standardize procedures. These steps could both lower costs and increase production. The latest argument at the home mill forced his hand.

Cliff identified log and timber procurement as an area ripe for improvement over a year ago. The awkward part of this realization was the knowledge that he had probably made a mistake

in appointing Ray, his trusted procurement forester from the Michigan mill, as the head of procurement for the entire company when they began expanding and buying other mills.

Ray understood the sawlog market in his part of Michigan well but was at a loss in the other regions. Instead of growing in his new role, Ray's focus had remained on the Michigan sawmill and his attempts to impose his "Michigan methods" on the other mills had been unsuccessful and even annoying. Now Cliff was moving forward with a project that Ray should have conceived and implemented himself a long time ago.

Cliff wanted to find out what worked well at each facility and see if these practices could be standardized. He also wanted to eliminate inefficient procedures. It would be logical to put Ray in charge of this project, but he had little confidence he could do the job. Cliff decided to head up the project himself, in part so that he could build on his work relationships at each mill.

Cliff remembered his father doing a similar assessment back in the 1990s. It had dragged on for two years due to the constant pull of other duties. Cliff hoped to avoid this and aimed to complete the project in a significantly shorter timeframe.

Ray had been feeling the pressure from his failure to adapt his methods across the

expanding company. Learning that he wouldn't be heading up this new project was a further blow to his ego. He believed that Cliff's approach was undermining his authority and disregarding his years of experience. Cliff had expected this but wasn't sure how to avoid it. His explanation of wanting to work more closely with the leadership team at each mill did little to improve the situation.

Cliff's team for this project included sawmill managers and lead procurement foresters from each mill: Maple Ridge Mill in Wisconsin, Mitten Head Mill in Michigan, Aspen Glow Mill in Minnesota, Rosebud Mill in Indiana, and Radler Grove Mill in Illinois, along with Ray, as Head of Procurement.

Despite his background, Cliff faced a series of challenges that tested the limits of his leadership and the company's project management capabilities. Cliff mistakenly thought he had a band, but this lumber company was largely a collection of solo artists.

Cliff meticulously identified the project's key activities and their dependencies, employing a project management approach that gave everyone plenty of time to work on the project on top of their other duties. The initial plan included:

1. Planning and Kickoff (2 weeks, mostly handled by Cliff)

2. Data Collection (4 weeks by mill managers in cooperation with procurement staff)

3. Analysis of Procurement Methods (4 weeks by procurement staff in cooperation with mill managers)

4. Field Assessments (5 weeks by Cliff with procurement staff cooperation)

5. Report Compilation (3 weeks by Cliff with Mill Manager reviews)

6. Final Recommendations (2 weeks, a window for a meeting of all parties)

He incorporated time buffers to account for potential delays, but the challenge lay in execution. Ensuring the project aligned with the company's overall goal of sawing lumber profitably was critical for success. The whole company should understand why they were trying to improve the log procurement process.

Cliff quickly discovered a dynamic that surprised him but shouldn't have: the real rivalry was not between the mills, but between the mill managers and the procurement staff. He had put Ray in charge of communicating with the mill managers about data collection and soon realized it was a source of friction. The mill managers viewed the procurement people as a necessary evil, while the procurement staff felt underappreciated and believed that each mill's ability to saw lumber rested on their shoulders. This didn't bode well for the kind of

cooperation needed for the procurement assessment, let alone the overall well-being of the company.

Ray, already feeling marginalized, began to actively resist Cliff's project. He subtly encouraged his procurement staff to prioritize their regular duties over the project tasks, leading to delays and further conflicts. This mixed messaging caused more problems between the mill managers and the procurement staff at each location.

The first cracks in the project appeared during the data collection phase. Bill and Nancy at the Wisconsin and Michigan sawmills promptly provided detailed data on timber and log purchases over the past ten years, while Tom and James struggled due to poor record-keeping. Susan faced challenges with disorganized historical data, and her mill's long-time procurement forester was of little help, as he was listening to Ray far more than he was to Susan.

These discrepancies slowed down the analysis, prompting Cliff to allocate more of his time and some of his support staff to the less prepared mills. This created tension and more than a little resentment in some corners. Bill and Nancy were annoyed that the others got help to do work they had done themselves. Bill even muttered to him that next time he would just

ignore his extra assignments now that he knew it meant someone else would take care of them.

Field assessments were supposed to be the project's cornerstone, ensuring accurate understanding of both the data and procedures through on-site evaluations and interviews. Cliff's visits, however, revealed deeper issues. The procurement staff were reluctant to confirm details to the mill managers and there was frequent bickering. The Wisconsin mill's long-standing relationships with local loggers contrasted sharply with the highly competitive and fickle suppliers near the Indiana mill, further highlighting the disparities between locations.

In Indiana, the situation reached a boiling point when Tom faced a near-mutiny from his procurement staff. Taking their cue from Ray, they resisted Tom's attempts to implement Cliff's directives, arguing that their methods were already optimal and that they were proprietary. It became clear to Cliff that the Indiana people really didn't think of themselves as part of the Skanawan Lumber family. Most of them preferred to wear their old Rosebud Lumber hats and hoodies.

The situation escalated to the point where one procurement forester named Leon quit and went to work for a rival sawmill, unwilling to share his procurement methods because he considered them trade secrets. Cliff thought

these secrets only amounted to a larger than average expense account, but he didn't take this loss lightly. This setback not only delayed the project further but also strained Tom's relationship with his remaining staff.

During the data collection phase, Tom and James exhibited signs of procrastination. They postponed starting their tasks until the last possible moment, leading to a rush to complete their work as deadlines approached. This resulted in poor quality and errors in the data they provided, further delaying the analysis and prompting Cliff to grudgingly allocate more resources to support them. He even let Tom add another part-time person to his office staff.

During a planned visit to the Illinois mill, Cliff arrived to find the team unprepared and disorganized. The procurement people had left for the field before he arrived and later claimed no one told them he was coming. It was clear that mill manager James had only begun to assemble information for Cliff a few minutes before he arrived. All in all, it was a chaotic and unproductive trip that had to be rescheduled. This incident further damaged Cliff's trust in his team and added to the growing frustration on all sides.

Ray, sensing an opportunity to further his agenda, began to sow discord among the procurement staff at the other mills. He suggested that Cliff's project was an

unnecessary intrusion and that their traditional methods were being unfairly scrutinized. This whisper campaign exacerbated the existing tensions and led to increased resistance to Cliff's efforts.

Cliff's responded to the project resistance by becoming more hands-on. This approach, while well-intentioned, came across as overbearing. He struggled to balance being a proactive leader without alienating his team. He was not immune to some of the same setbacks his staff was experiencing, and he caught himself putting off the less pleasant tasks. He also realized that while he might have chosen adequate time frames for individual tasks, he had not anticipated the time it would take to move sequentially from one to the next, especially with everyone having a lot of other work to do. Just because a procurement forester handed over a data report didn't mean the mill manager could start on integrating it with other information right away.

Cliff's insistence on adhering strictly to the project's schedule and methods without adequately considering the unique dynamics and historical issues at each mill further strained relationships. Susan, who had once been one of Cliff's staunch supporters, grew increasingly resentful of his demands and slow to get back to him. Nancy, normally a reliable and steady presence, began to express doubts about Cliff's leadership and the feasibility of the

project. He hoped he wasn't going to have to replace a mill manager before he was done.

As the project moved toward the report compilation phase, the initial enthusiasm had dwindled. The constant need for Cliff to step in and resolve conflicts or gather missing data delayed the process. His team grew increasingly frustrated with his micromanagement, and the project's initial momentum was lost.

Cliff's original timeline for the project was extended as tasks expanded to fill the time allotted for their completion. For example, the field assessments, initially planned to be completed in five weeks, dragged on for seven weeks because the team members took advantage of the ample time provided to them. This left them subject to delay any time something inevitably went wrong or when they were called away to handle their normal duties. Cliff had a hard time getting them to nail down dates for site visits. This inefficiency highlighted the need for more stringent timelines to keep the project on track.

The project's success depended on the timely completion of various interdependent tasks as well as having good information. When Bill and Nancy completed their data collection on time, they were forced to wait for Tom and James to finish theirs before the analysis could begin. This dependency caused a cascade of delays throughout the project, illustrating the

importance of managing task dependencies to avoid compounding delays.

The transition times between different phases of the project were not accurately accounted for, leading to significant discrepancies between individual task durations and the total project duration. For example, the handoff from data collection to analysis was delayed because the team did not start the next phase immediately after completing the previous one. This miscalculation resulted in the overall project taking much longer than anticipated.

Timely completion of this project should mean improvements in their procurement practices and result in better mill performance. In Cliff's mind, every delay was costing Skanawan Lumber money. He also anticipated that this project would build unity by doing away with recurring arguments of the type between Bill and Logan that had lit a fire under him to get started on this assessment. The sooner something is fixed, the better it works, he thought, but he knew that many of the staff didn't think anything was broken.

The last straw was when everyone was late in getting back to him with their comments on the draft report. A couple of them gave him detailed markups. Bill just emailed him "*good plan*." The situation with Ray had deteriorated to the point where he offered no comment at all on the draft plan. Cliff knew full well he wouldn't know what

they really thought until he implemented the plan if he let things go this way. He knew this was a lousy way to implement change and he doubted he would get much buy-in.

It became impossible to get everyone in the same place at the same time to have an implementation discussion. Some team members were unresponsive, and two of them claimed to have "no available dates for the foreseeable future." In the end, Cliff had to settle for a video conference, and he wasn't convinced that some of them didn't just mute him and work on other things during their meeting. He caught a couple of them not paying attention by asking them direct questions but gave up when he saw this was causing more harm than good.

Ray skipped the meeting entirely. Cliff met with Ray privately the next day and after a long discussion, they jointly decided it was time for Ray to retire. Cliff felt a keen sense of disappointment over this. He created this situation by promoting Ray beyond his abilities and he knew he was at fault for losing Ray as a productive team member.

Reflecting on the project afterwards, Cliff identified multiple troubles. He and his team had all suffered from distracted focus, trying to work on the project and take care of their normal day-to-day activities. Procrastination was rampant by nearly everyone. In the data collection tasks in particular, the work

expanded to fill up the time allowed. One delay inevitably led to another. All of this resulted in overruns in time and cost.

In the end, Cliff stood in his office looking at the final report. It was a mess of poorly-completed sections and conflicting data. If someone else had prepared it for him he would have called it dog crap, but this time he had only himself to blame.

His dreams of streamlining the company and driving efficiency had turned into a nightmare of delays and dysfunction. As he closed the report, he realized that while this project had failed, it showed him the deeper issues within the company. This understanding, while painful, was a necessary first step towards true growth and improvement in the future. His good intentions had not led to positive results, and he was left wondering about a path forward. The procurement project was intended to be the first of a series of improvement projects, and he realized he still had a lot to learn. How could he do better next time?

"Was he truly a part of a team that took good care of the land and served the people of his state well? If so, why were forest management plans never completed on time?"

Chapter 1. Tempo, Project Flow and Forestry

tem·po[1]

/ˈtempō/

the speed at which an event happens:

We're going to have to up the tempo (= work faster) if we want to finish on time.

1 From the Cambridge Dictionary

Tempo is usually associated with the pace of a musical piece, but it can also be viewed as a forceful analogy for project management in forestry. Forestry, blending art and science, requires a strategic approach to time management, much like conducting a symphony.

Each phase of forestry work demands a pace of its own, reflecting resource availability and overall priorities. The tempo in forestry projects is not just about speed but about rhythm and timing, ensuring that every task aligns with broader ownership and financial goals.

Foresters work on tasks and towards goals. While big picture progress in forestry might be far in the future, short term progress on the projects that set the future of the forest in motion can often be improved.

The Dynamics of Project Flow

Project flow in forestry can be likened to the natural flow of a river—sometimes smooth and steady, other times unpredictable with rapid changes. Effective project management recognizes and adapts to ebbs and flows in progress. It's about creating a controlled environment where projects can proceed smoothly yet be flexible enough to accommodate unforeseen changes. This is crucial in forestry, where the landforms, soils, timber types, weather, and personalities can dictate the pace and progress of work.

Work on forestry projects typically moves through several phases: planning, execution, monitoring, and adjustment. Planning for projects involves defining clear objectives, milestones, deadlines and setting the tempo. Execution requires maintaining or adjusting the tempo as the project progresses, reacting to delays, or capitalizing on opportunities to move ahead more quickly. Monitoring and adjustments ensure that the project remains on track by making necessary shifts in resources and schedules to respond to ground realities.

The Importance of Timely Completion

Timely project completion is vital, as the benefits—environmental, financial, social or otherwise—are often time-sensitive. Completing projects on schedule or ahead of time ensures that these benefits are realized sooner. This may be crucial for maintaining the health and sustainability of forests and for putting a forest's growth and development on the right trajectory. Prompt completion of projects can enhance the financial viability of forestry operations, businesses and agencies. This is particularly true when operating under fixed contracts terms or budgets.

Effective project management goes beyond adhering to timelines. In forestry, this means managing resources sustainably, ensuring environmental compliance, and maximizing financial returns to meet landowner objectives. An effective approach aids in achieving project-specific goals and builds the organization's reputation for reliability and efficiency. A reputation of this type makes an organization a preferred partner for future ventures. Repeat business is a key part of sustainability.

Completing projects on time or ahead of schedule allows for the faster realization of the project's goals and benefits. For example, early completion of access road improvements can enable quicker and more effective disease control and pest management within forest

areas and make the area accessible to forest users. Certain road improvements, like re-enforcing soft areas with crushed stone can extend the accessible seasons.

When projects finish on time, resources like labor and equipment can be reallocated to new projects sooner, maximizing their use and reducing idle time. This efficiency is fundamental in maintaining operational tempo and can lead to cost savings and increased project turnaround.

Delays in one project can create a ripple effect, impacting the scheduling and resource allocation of other projects. By maintaining the planned schedule, project managers can avoid such complications, ensuring that subsequent projects begin on time and are not hindered by resource or scheduling conflicts.

Strategic Advantages

Timely project completion can provide strategic advantages in market positioning by demonstrating capability and reliability. Being able to consistently deliver on promises can set a company, agency or individual apart from its competitors, making it a preferred choice for people looking for timely and reliable project execution.

Committing to and achieving timely project completion fosters a culture of efficiency and accountability within an organization. This

cultural aspect can influence all levels of operations, encouraging teams to work more effectively and to continually improve project delivery processes.

Why is it taken for granted in many organization that work will be finished late or be incomplete? Why aren't the advantages of timely completion of projects being recognized? The answers to these questions lie in common challenges in projects that are deeply rooted in human nature, along with our willingness to excuse ourselves for not finding ways to improve.

Common Challenges in Project Management

Some of the issues commonly encountered in project management are not immediately recognized as obstacles to completing tasks efficiently and on time. Part of this lies in the absence of recognition that much of our work is project management. Foresters, loggers, surveyors and others think of their titles as identities, with their work being the things they do. The truth is this work is almost always an interconnected series of projects. One person's project may simply be a task in another larger symphony of progress.

Sometimes the oversight of the project belongs to others – others who do little to communicate the big picture to us. In many cases there is no project management going on at all. Work is simply assigned and someone (bosses,

landowners, clients, customers, agencies) who then waits for it to be complete. The solution to this is to own and be accountable for every aspect of your work as a project that you are managing.

A common scenario in many organizations is to accept project delays as the norm. Is this really an acceptable business practice? In what way does later completion further the goals of the organization? Not meeting deadlines or expectations can have significant consequences.

Allan Elder's 2006 publication, *The Five Diseases of Project Management* is an insightful analysis of the common pitfalls that teams often encounter in projects. These "diseases", if not addressed, can significantly hinder the success of any project.

These diseases are as follows:

- Bad Multitasking;
- The Student Syndrome;
- Parkinson's Law
- Task Dependency; and
- Project Management Math (2+2=5).

Let's explore each of these diseases in detail to better understand their implications and how they can be mitigated.

Bad Multitasking

Elder points out that bad multitasking is one of the primary diseases affecting project

management. This occurs when team members switch between tasks that are not critical to the project's main chain of events. Such behavior can disrupt the flow of work, leading to delays and incomplete tasks by the end of the work window. Although multitasking might seem efficient, it often results in the dilution of effort and decreased quality of work, as focus and momentum are lost.

Suppose you are working on a timber appraisal that must be completed by the end of the week for a court filing. Your supervisor steps in with a request that you check on the logging operation on one of his timber sales and a coworker calls in a favor to have you read over her latest report. Bad multitasking would involve interrupting the flow of your appraisal to rush out the field to check on the logging and then coming back to your office to read half of your coworkers report. Then you guiltily go back to your appraisal and have to figure out where you left off. The next day you still have to read the other half of that report for your coworker. Flow is lost and everything takes longer to complete.

While good multitasking – such as participating in conference calls on a commute – is possible, opportunities for good multitasking are rare. Some argue that it is mostly impossible to do two things at once and that the harm comes in switching between tasks. Momentum is lost in

the transition and little effective progress is made on either item.

Elder suggests that bad multitasking only occurs when the switching between tasks and projects holds up someone who is waiting for your task to complete before they can proceed. Since juggling multiple projects at various stages is a commonplace aspect of forestry, this point is a good one. This book will help you identify where effort should go and when.

Student Syndrome

The second disease Elder discusses is the student syndrome, where individuals postpone starting tasks until the last possible moment. This procrastination leads to a rush to complete work as deadlines approach, often resulting in poor quality and errors.

This syndrome is exacerbated by what is known as Murphy's Law, which posits that if something can go wrong, it likely will, and at the worst possible time.

Murphy's law is simply another way of saying that statistical fluctuation is possible and unpleasant or unproductive possibilities may happen. If they happen when no time cushion is left to accommodate them, tasks and projects are inevitably late.

Elder points out that Student Syndrome underscores how quickly many things actually can be done and how good people are at

estimating the amount of time needed for the actual task. They do this even as they conveniently overlook the lurking unpleasant possibility of Murphy.

The remedy for Student Syndrome is to encourage earlier starts on tasks and to manage time buffers more effectively to avoid last-minute rushes.

Parkinson's Law

Parkinson's Law is another significant issue in project management highlighted by Elder. This law observes that work expands to fill the time allotted for its completion. With this in mind, if too much time is given to a task, it can lead to inefficiencies and unnecessary enhancements that do not contribute to the project's goals.

This phenomenon was first documented by C. Northcote Parkinson in a 1955 essay in *The Economist*. He observed that this was a consequence of bosses wanting more subordinates but fewer rivals and a tendency of these same people to create work for one another. Others have noted this as a petty tyranny of an ever-expanding middle management, whose existence is somehow justified by the length of time it takes them to accomplish things.

To counteract Parkinson's Law, Elder recommends setting more stringent timelines and clarifying the scope of work to ensure that

teams remain focused on essential activities. Shorter timelines deprive people of the time and runway to expand the duration and importance of their tasks.

Task Dependency

Elder identifies task dependency as a project management disease where the completion of one task depends on the completion of another. This dependency can lead to a cascade of delays throughout the project. The dependency itself isn't a disease but rather a featured reality of most projects. Starting one task often hinges on completion of another. For example, you can't mark trees for a timber harvest without a prescription and you cannot create a prescription without forest stand data and a clear set of goals.

The problem is that task dependency lends itself to compounding delays as soon as one task delays another. Elder suggests that managing task dependencies requires careful planning and coordination to ensure that each task is completed in a timely manner. Timely completion allows dependent tasks to commence without delay.

Project Management Math

The final disease Elder discusses is what he calls project management math, where the sum of individual task durations does not accurately reflect the total project duration. Does two plus

two really equal five? This discrepancy often arises from delays in transitioning tasks between different team members or departments. Suppose your team spent two days cruising timber on a property and then handed the data off to a supervisor who double-checked the calculations and formatted them into a report. Will this person start this work immediately? What if the hand off was at 1 PM on a Friday? Is it likely the work on the next step won't start until the following week?

Elder recommends improving handoff processes and minimizing transition times between tasks to better align individual efforts with the overall project timeline. It also helps if the person responsible for the next step in the chain realizes their work is part of a larger project – one in which the project's progress now rests with them.

We will discuss project duration in more detail later, but it is important to realize the role this project management math plays in determining accurate timelines for progress.

Elder's five diseases of project management highlight the various ways projects can be derailed by internal inefficiencies and poor management practices. By understanding and addressing these diseases, project managers can enhance their teams' productivity and increase the likelihood of project success. Elder's analysis provides a framework for diagnosing and

remedying common project management issues, emphasizing the importance of focused task management, timely execution, and efficient resource allocation.

Leach's Immutable Laws of Project Management

Larry Leach (2000) introduces several immutable laws of project management in his comprehensive book, *Critical Chain Project Management*. These "immutable laws" are useful in expanding on Elder's project management diseases.

We will look at several examples of Leach's Immutable Law, including the following:

1. No project completes on time, within budget, with the same staff that started it, and the project does not do what it is supposed to do. It is highly unlikely that yours will be the first.
2. One advantage of fuzzy project objectives is that they let you avoid embarrassment in estimating the corresponding costs.
3. The effort required correcting a project that is off course increases geometrically with time.
4. Everyone else understands the project purpose statement you wrote differently.
5. Measurable benefits are real. Intangible benefits are not measurable and so intangible benefits are not real.

6. The greater the project's technical complexity, the less you need a technician to manage it.
7. A carelessly planned project will take three times longer to complete than expected. A carefully planned project will only take twice as long.
8. When the project is going well, something will go wrong.
9. If the user does not believe in the system, a parallel system will be developed. Neither system will work very well.
10. Benefits achieved are a function of the thoroughness of the post-audit check.

Is Leach right about projects not finishing on time and within their budget? Anyone who has ever built or remodeled a home knows this is true. Is this frequently true in your work as well? It is an unfortunately common occurrence in the forestry world and everywhere else.

Consider a project to restore a small wetland area. At the beginning, the team is hopeful. They create a detailed plan, allocate funds, and set a timeline. When they start working, unexpected issues arise. Heavy rains flood the area, delaying the work. The supplier for native plants goes out of business, causing further delays and forcing the team to find new suppliers. Some team members leave the project due to other commitments, requiring replacements who need time to get up to speed. These problems

lead to delays and increased costs, necessitating changes that weren't part of the original plan.

As the project continues, the initial benefits—improved wildlife habitat, better water quality, and community engagement—become harder to achieve (Law 1). Early estimates of these benefits were made under ideal conditions, but as real-world issues emerge, the gap between expectation and reality grows. The project might end up providing fewer benefits than initially hoped, illustrating Leach's first corollary to this law: *"The benefits will be smaller than initially estimated, if they made estimates at all."*

Finally, when the wetland restoration is completed, it's behind schedule and over budget. Yet, despite these issues, the project is considered a success. The wetland is restored with new plants and improved water flow. Some aspects of the project don't work as planned, however. The plants don't establish as quickly as expected, and the water quality improvements are less significant than predicted. This aligns with this law's second corollary: *"The system finally installed will be late and will not do what it is supposed to do."*

In the end, the project costs more but achieves its technical goals, albeit not perfectly. This story highlights a key lesson in project management: while success is often possible, it frequently comes with higher costs and more challenges than initially expected. This

narrative, reflecting the third corollary—*"It will cost more but will be technically successful"*—serves as a cautionary tale for future projects. It should also jump out to you as a grand opportunity for improvement. If the status quo is to not live up to expectation, there should be a huge advantage in being a person, team or organization that delivers on time and on budget.

The next immutable law is that fuzzy project objectives let you avoid embarrassment in estimating the corresponding costs (Law 2). This concept can be illustrated with a small-scale land management project like setting up a community firewood bank.

Imagine a local non-profit is tasked with creating this firewood bank. At the start, the objectives are vague—goals like "help residents during winter" and "provide an emergency firewood supply" are mentioned, but the specifics are missing. Because the goals are not clearly defined, you don't have to specify exactly how much firewood will be available, how it will be distributed, or how many people it will serve. This ambiguity allows you to give broad cost estimates without committing to precise numbers. Maybe all that's hoped for is some firewood donations and that a distribution network will arise organically.

As the project moves forward, this lack of clarity works in the organization's favor. When

unexpected costs arise, such as low donations, higher prices for purchased firewood or for transportation, they can adjust the budget without it seeming like they made a mistake. Since the goals weren't specific, there's no clear baseline to compare the costs against, so it's harder for stakeholders to pinpoint where estimates might have been off.

When the community firewood bank is completed, it will meet the general objective of helping residents during winter and providing an emergency firewood supply, but at a far lower scale than originally imagined. Since objectives were fuzzy, there's flexibility in how success is measured. Maybe the firewood bank has less firewood than initially hoped, or it operates differently than originally considered, but it's still seen as a success. This flexibility in goals means you can present the project positively, regardless of the initial cost estimates. It also means there is a success story to point to the next time a funding opportunity arises. This is how hitting a single can be framed as a homerun or a puddle can be called a pond. This sort of hype may be good for individuals, but it does not advance successful projects.

Leach says that the effort required in correcting a project that is off course increases geometrically with time (Law 3). This idea can be demonstrated with a state-wide water quality enhancement project creating a collection of

portable skidder bridges that can be loaned or rented to loggers and landowners.

Imagine you are tasked with making the skidder bridge project a reality. Initially, everything seems to be going well. What if you soon you notice that the construction of the bridges is behind schedule and that the cants you need are more difficult to come by than expected? Or that the quality of wood used is not meeting the required standards? At this point, you might be tempted to wait and see if these issues resolve themselves, but according to the principle, the longer you wait to address these problems, the harder it becomes to fix them. It's no fun to reject ten bridges that haven't been built correctly but this is a better outcome than waiting and having to reject twenty.

As time passes, the delays and quality issues compound. The longer the substandard materials are used, the more bridges will need to be repaired or replaced, leading to increased costs and further delays. If these problems are not addressed promptly, the effort required to correct them increases significantly, as highlighted by the first corollary: *"The longer you wait, the harder it gets."*

If you postpone addressing these issues until the construction is near completion, it becomes nearly impossible to correct the course. By then, the bridges might be unsafe for use, requiring a complete overhaul of the project and a

significant delay in getting them in circulation. This situation illustrates the second corollary: *"If you wait until the project is completed, it is too late."*

It's crucial to address problems as soon as they arise, even if it feels embarrassing to admit there are issues early on. For instance, if you notice the delays and quality issues, take immediate action to halt construction, assist in procuring the quantity and quality of logs needed for the cants and ensure that quality standards are met going forward. This proactive approach can prevent the situation from escalating and becoming unmanageable, reflecting the third corollary: *"Do it now regardless of the embarrassment."*

Leach maintains that everyone else has a different understanding of the project purpose statement than the person who wrote it (Law 4). This idea can be illustrated with a small-scale forestry project such as establishing a new tree nursery to provide saplings for reforestation efforts.

Imagine that the county forester is tasked with creating a tree nursery on some old pastureland owned by the county. At the start, the forester writes a purpose statement that she believes is clear: "The goal is to produce healthy saplings for reforestation projects in the county." As the project progresses, however, it becomes apparent that other county employees have a

different interpretation of this statement. Some team members think the focus should be on producing a wide variety of tree species, while others believe the emphasis should be on quantity over diversity and still others think this nursery will produce large street trees for urban projects in the county's two cities. Meanwhile she has a contractor on site to do excavation work and has lined up appropriate seed sources and greenhouse space to produce the initial seedlings.

Despite her efforts to clarify the project's purpose, misunderstandings persist. The forester incorporates the stated purpose into meeting presentations, detailed emails, and creates promotional visual aids to explain that the primary goal is to produce a large number of healthy saplings, but someone still interprets it differently. This scenario illustrates the first corollary of this law: *"If you explain the purpose so clearly that no one could possibly misunderstand, someone will."* As George Bernard Shaw once said, *"The single biggest problem in communication is the illusion that it has taken place."*

As the project continues, the county forester decides to implement a strategy that she is confident will meet everyone's approval. She decides to focus on producing a mix of native tree species, believing this approach balances both quantity and diversity, thereby satisfying all stakeholders. Unfortunately, when she

presents this plan, one county department head is dissatisfied. He argues that the focus should be on rare and endangered species instead. This situation reflects the second corollary: *"If you do something that you are sure will meet everyone's approval, someone will not like it."*

This leads to such frustration that the county forester needs a day alone in the woods to recover. This principle teaches that despite your best efforts, different people will have different interpretations of the project's purpose, and achieving unanimous approval is unlikely. The key takeaway is to accept that misunderstandings and disagreements are part of the process.

Another of Leach's immutable laws is that measurable benefits are real (Law 5). If a benefit is not measurable, it is not real. Let's look at a project intended to obtain forest certification for a group of landowners in a small region to see this law in action.

A forester has been hired by a local Non-Governmental Organization (NGO) to implement this certification project for a group of landowners with ownerships totaling 5,000 acres in a county-wide region. The primary measurable benefit is the guarantee that voluntary forestry water quality best management practices (BMPs) will be followed on these properties. This can be tracked through regular monitoring of active harvesting sites,

making the benefit concrete and easily communicated to stakeholders.

The promotional material put out by the NGO for this project also suggests intangible benefits, such as having a landscape-scale impact due to the acreage involved, improved relationships with local and regional special interest groups, raising the profile of both certification and forest management practices in the county and an even higher timber prices for the landowners due to collective bargaining of prices with mills by all of the participating landowners.

These benefits are implied but not guaranteed and under close examination they are not measurable. There is no direct evidence to support these claims. According to the principle, because these benefits are intangible and not easily measurable, they are often considered not real.

The first corollary to this law states: *"Intangible benefits are real if you can prove that they are real."* Yet, in this scenario, despite the certification enrolling a significant number of landowners in the program, there are no concrete methods or data to prove these intangible benefits. The certification effort failed to attract enough large landowners to reach the acreage goal, even as the large number of smaller acreage landowners rapidly depleted the project budget. It turns out that certifying a

90-acre property in the program took almost as much effort as certifying a 400-acre property.

Media assessments to gauge community sentiment toward the group certification yielded a fair number of photos, especially those of the certification signs, but no discussion or inquiries for more information. A year and a half into the certification effort, there was only 2,000-acres enrolled. While the acreage could be quantified, a landscape-scale impact could not.

Several of the landowners have sold timber since they were certified by but there was no organic effort by them or their consulting foresters to collectively bargain for higher wood prices. One of the larger landowners insisted that the program forester quantify the price differential and was disappointed to learn there was no clear difference between the prices she received from the mills that bought the products and those realized by neighbors. The mill did assure her, however, that they valued the certification and had even kept the wood they purchased from her in a separate pile. This was little consolation in the absence of a price premium.

After the certification enrollment budget was used up, the only tangible and verifiable benefit is the adherence to water quality BMPs. This benefit was due to enforced contractual obligations in the contracts for the timber sales

that took place, with site visits by the forester managing the certification project during and immediately after the harvests. The expected promotion and awareness of the forest certification efforts, the landscape-scale impact and the premium timber prices do not materialize, as there is no direct data supporting these outcomes. The project's success, therefore, is limited to one measurable benefit, while the other implied benefits remain unproven and effectively unrealized. While implied benefits can be appealing, they often do not materialize without concrete evidence. Ensuring that key benefits are measurable and verifiable helps to secure the project's success and demonstrate its real impact.

The next immutable law states that the greater the project's technical complexity, the less you need a technician to manage it (Law 6). The more details, the greater amount of coordination necessary. This idea can be illustrated with a project to produce detailed and enhanced mapping of forest types by a state natural resources agency in a four-county region in the northernmost part of the state.

Imagine the agency is tasked to do this mapping to assist the state legislature's future policy determinations geared toward assisting the region. Who should lead this project? Given the technical complexity, involving fieldwork, LIDAR and Geographic Information Systems (GIS) it might seem logical to appoint one of the

agency's experienced GIS technicians as the project manager. This law suggests otherwise: it's more important to have a solid manager who can effectively lead the project and assemble and coordinate the right team of technicians.

According to this technical complexity law's first corollary: "*Get the best manager you can. The manager will get the technicians.*" In this scenario, the agency should focus on finding a highly skilled project manager with strong leadership and organizational abilities. This manager understands how to coordinate efforts, manage resources, and communicate with stakeholders. Once in place, the manager selects the best technicians available to the agency — experts in LIDAR, GIS, forestry, and data analysis—who bring the necessary technical skills to the project.

The law's second corollary states: *"The reverse of corollary one is almost never true."* If the agency appointed a skilled technician as the project manager, it may well turn out that despite their technical expertise, they struggle with the broader aspects of project management and moving others in the right direction. They might excel in detailed mapping work but lack the skills to effectively coordinate the team, manage the budget, and handle stakeholder communications. This could lead to delays, budget overruns, and a disjointed team effort.

Under the leadership of a skilled project manager and team leader, the project's tempo and flow are enhanced, leading to timely results. The manager ensures that all technicians have clear roles, deadlines are met, and resources are appropriately allocated. The project then progresses smoothly and successfully achieves its objectives.

According to Leach, a carelessly planned project will take three times longer to complete than expected but a carefully planned project will only take twice as long (Law 7). Could this be true? Chances are you have experienced something like this.

Let's look at the response to an unexpected event by way of an example. Suppose 125,000 acres of timberland held by an institutional investor is hit with an early winter ice storm that causes widespread damage to the timber resource. How might this change their forest management plans? The first step in determining this is to complete a comprehensive assessment of the damage.

The property is a collection of over 60 parcels, spread across a five-county area. It is managed by a Timberland Investment Management Organization (TIMO) with a field forestry staff. What if the project is carelessly planned or worse not ever viewed as a project but just as an individual task that could be completed over the course of a single winter? It has vague timelines

for reporting progress, no real leader and an inadequate allocation of staff time.

This lack of careful planning coupled with unexpected issues like equipment failures, unanticipated weather conditions, and conflicting staff priorities means the ice damage assessment stretches out until early October of the following year. Resource shortages arise, extending the project to 18 months instead of the six-month period that was originally expected.

How should this assessment have been handled? The TIMO could have assigned a single forester as the project lead and allocated staff time among the foresters and technicians who were in charge of managing each tract. The lead forester would then establish standard assessment and mapping methods and detailed timelines. An original due date of March 1 could have been specified, but the first corollary to this law states: *"If nothing can possibly go wrong, it will anyway"*.

Despite the meticulous planning, unforeseen challenges still occur—perhaps weather conditions are worse than predicted, or key team members become unavailable. These issues double the expected timeline, but the project still finishes by June 1. Even if the best planning can't account for every variable, it can still improve on the incomplete alternative.

Elder introduced us to Murphy's law earlier and Leach includes an immutable law that reinforces this reality: When the project is going well, something will go wrong (Law 8). Let's look at a project aimed at establishing and mapping a new trail system on lands under a conservation easement owned by the state and enforced by the state's Department of Natural Resources (DNR).

At the outset, the project progresses smoothly. The team efficiently maps out the new trail system using the existing roads and informal trails and proposed extensions, the weather remains favorable, and the necessary cooperation from the landowner is forthcoming. Progress is steady, and it looks like the project might be completed ahead of schedule.

Things were progressing so well that something was bound to happen – if something is a statistical possibility, it is or should be unsurprising when it happens. Unexpectedly, at least by the trail staff, the landowner closes 1,200-acre portion of the property for forest management activities (logging and road construction). This section hasn't been reviewed or mapped and it was thought that several new miles of trail would be built there. Now the area is closed for six months, and no fieldwork can be done. The landowner has made no secret of their intent to exercise this right at this time, but a lack of communication

among the DNR staff means that the trail team was caught by surprise.

The first corollary to this law states: "*When things cannot get any worse, they will*." Shortly after being informed that the area will be closed, the trail crew project leader learns that any remaining budget that hasn't been expended with the scheduled project window will be retracted.

The second corollary to this law states: *"When things appear to be going better, you have overlooked something."* The six-month closure period for forest management activities is the maximum window allowed, but it is not a requirement. It turns out that all of the work was completed in four months and the area was reopened for trail work. The trail project leader is excited to get back on track but when she requests that the field crew resume the work, they have been assigned to another time-sensitive project. It looks like a full year will pass before this project can be resumed.

The next of Leach's immutable laws is that if the user does not believe in the system, a parallel system will be developed and neither system will work very well (Law 9). Take the case of a large hardwood lumber company that has two sawmills and five procurement foresters who purchase timber from private landowners.

The company implements a new system for purchasing timber, including cruising and

bidding procedures and specifications. The procurement foresters find the new system cumbersome and unworkable. They believe it does not account for the wide range of property types, landowners and purchasing opportunities they encounter.

As a result of their lack of confidence in the new system, each forester develops their own method for cruising, bidding, and purchasing timber. One forester might rely more on traditional manual measurements, another might use a custom spreadsheet, and yet another might use an outdated software system just because they are familiar with it from past work. These parallel systems lead to inconsistencies in how timber is evaluated and purchased. The inconsistencies themselves aren't a problem unless they result in paying too much money or purchasing timber the mills don't need. Instead, the lack of uniformity is making them less efficient and fails to take advantage of some potential cost savings.

This situation demonstrates the principle that neither system works very well. The lack of a unified approach leads to inefficiencies, miscommunications and missed opportunities. One forester's method might result in overbidding on poor quality timber. Another forester may miss opportunities for high-quality purchases due to conservative estimates. In the end, the quantity and quality of the sawmills log supply suffers.

The lack of standardization makes it difficult for the company to compare the performance of different foresters and accurately track their purchases and expenditures. This creates confusion and frustration among the procurement team and pits them against the sawmill managers.

This principle shows the importance of having a unified and trusted system in place. When users do not believe in the system and create parallel processes, it leads to inefficiencies, inconsistencies, and overall dissatisfaction. A cohesive and well-accepted system would be designed jointly by all five of the procurement foresters, in cooperation with the lumber company's managers.

Another of Leach's more important immutable laws is that the benefits achieved in a project are a function of the thoroughness of the post-audit check (Law 10). Let's look at how this might play out in a new inventory management system for a large timberland company. A new feature to this system will be collecting additional non-timber data in each forest stand, including seasonal harvesting potential and a check of (Natural Resource Conservation Service's (NRCS) soil mapping and suitability ratings.

The company has decided to implement this new system to better track and manage its timber resources across multiple regions. The

project team is tasked with designing, developing, and deploying this system. To ensure accountability and thorough implementation, the company announces that an independent post-audit will be conducted once the system is up and running.

The project team, led by a young forester eager to make her mark, is well aware of the upcoming post-audit. The team is motivated to deliver a high-quality system on schedule and within budget. They rigorously follow best practices, conduct check cruising, and ensure that all of the foresters and technicians involved are following the new procedures. The knowledge that their work will be scrutinized by an outsider pushes them to avoid cutting corners and to thoroughly document their processes. They know what is wanted and this is what they will deliver.

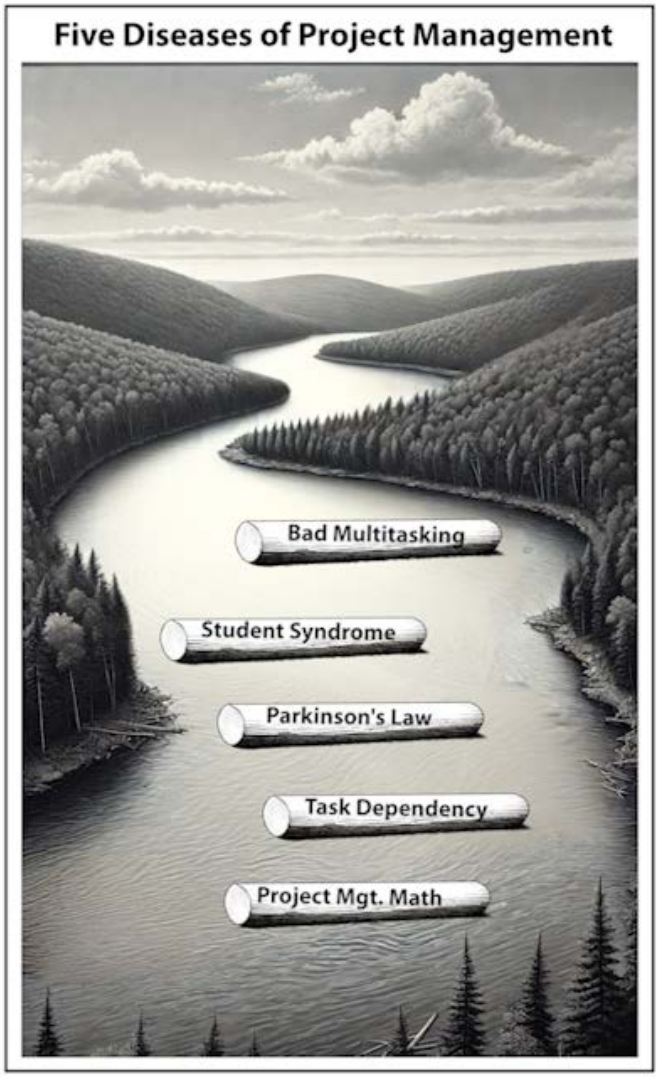
The first corollary to this law states: "*The prospect of an independent post-audit provides the project team with a powerful incentive to deliver a good system on schedule within budget.*" This drives them to deliver their best work, ensuring that the benefits of the new system are fully realized.

As a result of this diligent effort, the new inventory management system has been successfully implemented. The post-audit confirms that the system meets all specified requirements, operates efficiently, and has been

delivered on time and within budget. This thorough post-audit validates the project's success and highlights areas for future improvement, ensuring continuous enhancement of the system. We do our best work when someone is looking.

Leach has an encouraging capstone to his laws of project management: ***"No law is immutable"***. Good thing, because much of the progress we can realize in improving the tempo and flow of projects involves overcoming the situations that were just described. Taken together, Elder's diseases and Leach's immutable laws are a fair representation of the status quo for much of our work.

Are all of these things just the inevitable gravity of human nature? Perhaps, but another way to view them is like the natural tendency some of us have to gain weight as we grow older and become less active. Tendency is not destiny. Most unpleasant tendencies can be overcome with solid habits and engagement of our native brain power.


Five Diseases of Project Management
Bad Multitasking
Student Syndrome
Parkinson's Law
Task Dependency
Project Mgt. Math

If we improve the tempo of our work, won't it be more enjoyable and satisfying? If we improve project flow, won't it bring us closer to our goals sooner? Read on if you agree. We are going to look next at a different approach to project management that places an emphasis on tempo and flow: Critical Chain Project Management. But first let's have a look at the anxiety placed on an otherwise capable forester by poor project management.

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Case Story: An Anxious State Forester

Russ is a state land forester in the Public Lands Division of his state's Bureau of Forestry. He is part of a multidisciplinary team that produces and updates state forest management plans. Generally, the division does a commendable job of managing for multiple uses, accommodating timber production, wildlife, recreation, biodiversity, carbon sequestration, and a multitude of other benefits for the people of the state.

Recently, Russ has been feeling a growing sense of anxiety about his career. Having worked for ten years, he finds himself questioning his effectiveness in his job. Was he truly a part of a team that took good care of the land and served the people of his state well? If so, why were forest management plans never completed on time? He believed that details in the plans could always be better than they were. He couldn't

ignore the fact that with plans frequently overdue they were delaying the benefits and losing opportunities for things such as seasons of public access and providing a sufficient timber supply to support the rural economy.

It took Russ a few years to become acclimated to his job and understand the management planning process fully. He considered himself a team player and took directions from his manager. He was initially hopeful when his first manager retired and Kara, one of his older coworkers with a general environmental background, was promoted to program lead. His hope soon faded as he realized that Kara's management style led to delays, with priorities that seemed off. Kara called herself a “land manager” which was another way of saying she wasn’t a forester. She never missed an opportunity to imply that the foresters were merely technicians who needed her oversight to effectively steward the land. Despite his support for her, nothing ever seemed to get done on time. Any time things became hopelessly overdue the emphasis shifted from doing it right to getting it done.

Whenever the team updated or created a new forest management plan, Russ had to conduct a resource inventory and submit it to various team members within the organization before proceeding further. The state natural heritage review team always caused delays, never delivering on time despite Russ experimenting

with different deadlines. This was frustrating, especially since schedules were set with ample time but invariably took longer due to what Russ considered nonsensical diversions. The natural heritage staff never started on any of his requests until the last minute, no matter how much time they were given.

Kara emphasized the importance of continuous improvement. She equated this with staying on top of every new trend. She often sent Russ links to webinars and meetings that conflicted with his schedule and delayed his work. Anytime the political wing of the agency needed something, Kara instructed everyone to drop their tasks and respond, often to queries that a simple Google search could resolve. Russ felt that dedicating one person to handling these duties full-time would be more efficient and less disruptive. He also failed to see how time spent on these things helped them do a good job of their core mission as stewards of state land. His time was wasted answering questions for self-important dimwits.

Ultimately, the division's project management inefficiencies were highlighted when the Story Mountain Forest management plan was completed 18 months late. Despite it being a key land acquisition with a wide range of benefits for state residents, including a timber resource and recreational improvements, the delay was significant. Kara somehow mastered underestimating the time needed to transition

between each task, even as she gave team members wide swaths of time in which to work. The work inevitably filled or exceeded all the time that was given.

The team celebrated the overdue completion with a day-long field trip to the site. Kara invited a wide range of stakeholders and other Bureau of Forestry leaders. A puzzled Russ saw no reason to celebrate something finished so late.

Over time, Russ was increasingly tasked with more responsibilities, and the inefficiencies and delays in scheduling frustrated him further. He sensed that things could be better, but no improvements were being made and Kara was uninterested in suggestions (she always responded to suggestions by asking for detailed memos that she never responded to). This contributed to Russ's growing anxiety about whether he could contribute more effectively and if the division could be managed better.

Russ's largest frustration came from everyone else's acceptance of this. Nothing could be done to fix this, they told him. One day he boldly asked Kara how the planning processes meshed with her mantra of continuous improvement, she changed the subject and didn't talk to him for two weeks. Her new frostiness hardened his resolve for change.

Key Points in Russ's Project Experience:

Russ' experience as a state forester in the Public Lands Division illustrates several of the "diseases" of project management identified by Allan Elder and echoed in Larry Leach's immutable laws. The consistent delays in completing forest management plans highlight these issues:

1. Bad Multitasking:

- Russ frequently faces disruptions from political queries and meetings, diverting his attention from critical tasks. This exemplifies how multitasking leads to inefficiencies and slows down project progress.

2. Student Syndrome:

- The natural heritage review team's habit of starting tasks at the last-minute causes significant delays. This procrastination forces Russ and his team to rush through tasks, compromising quality and timeliness.

3. Parkinson's Law:

- The ample time given for tasks invariably leads to work expanding to fill the available time. Kara's underestimation of transition times and her broad timelines result in

delays, as team members take up all the available time and more.

4. Task Dependency:

- Delays in one task, such as the natural heritage review, cascade and hold up subsequent tasks. Russ' work is frequently delayed by dependencies on others, illustrating how task dependency can compound delays throughout a project.

5. Project Management Math:

- The miscalculation of the total project duration due to poor handoffs and extended timelines is evident in Russ' experiences. Despite ample individual task durations, the overall project timeline is underestimated, leading to significant overruns.

6. No Law is Immutable:

- Russ's sense that projects can be done better and that he is personally capable of doing more in the right situation are an accurate representation of what many people think and feel about their work situations and his refusal to accept the idea that "this is just the way

things are" align nicely with Leach's claim that none of the laws of project management are immutable.

"Early on in his time with the team Russ found that he was going to be late in submitting a forest management plan to Baldy for final approval."

Chapter 2. What is Critical Chain Project Management?

Critical Chain Project Management (CCPM) is a direct application of Theory of Constraints (TOC) principles to project management. The relationship between TOC and CCPM is more fully explained later in this chapter, but its application to projects was intended as an improvement on traditional approaches in this field.

Traditional project management methods often result in inefficiencies due to overestimation of task durations and excessive time buffers for safety. Everyone likes to give themselves a generous margin for error when telling others how long something will take.

CCPM extends TOC by applying its concepts to the planning and execution of projects. It recognizes that a project's success is *determined by its critical chain of dependent events.* In CCPM this concept is expanded to include not just task dependencies but also resource constraints (Elder, 2006).

CCPM shifts the focus from individual tasks to the overall project timeline. Task durations are estimated using a 50% confidence interval, meaning each task has an equal chance of being completed early or late. When given a choice, most people will choose a much longer timeline for a task (closer to a 90% confidence interval) to be more certain of completing it when they say they will. The problem with this is that the longer window becomes their reality, and the benefit of an early completion is lost.

In practice the CCPM approach usually means cutting the window of time for each task in half. The remaining task times that were allocated for safety buffers that were previously embedded in each task, are aggregated into strategic buffers at the end of the critical chain, reducing waste and promoting efficiency (Eby, 2022). Instead of building long buffers into each task that are inevitably used up because of Elder's project management diseases, faster completions are triggered and the entire project timeline benefits whenever tasks are completed early.

Key Components of CCPM

Task synchronization (tempo) and flow efficiency are vital aspects of CCPM. This method emphasizes the harmonization of tasks to ensure that activities align with the project's critical chain. This requires a clear understanding of task dependencies and resource allocations. Tasks are sequenced to

maximize the use of available resources without causing delays in the critical chain (Goldratt, 1984). By maintaining this alignment, CCPM ensures that the project's momentum is sustained, preventing delays that can arise from misaligned tasks and resources.

Reduction of multitasking is another fundamental principle of CCPM. Multitasking, one of Elders “diseases of project management” is a common practice in most work environments. It often leads to inefficiencies and increased project durations. CCPM advises against multitasking, promoting instead a focused approach where resources are dedicated to a single task at a time. This method improves individual task efficiency and enhances overall project flow by reducing time lost in task-switching and context-changing (Woeppel, 2006). By limiting multitasking, CCPM helps project teams to concentrate better on their tasks, leading to faster and more reliable task completion.

Buffer management is a critical component of CCPM. Buffers are incorporated into project schedules to absorb uncertainties and variabilities in task durations. CCPM distinguishes between different types of buffers, such as project buffers, feeding buffers, and resource buffers. While buffers are most often thought of in terms of time, they can also be materials, labor and the availability of equipment and expertise.

Project buffers are placed at the end of the project to protect the overall timeline, while feeding buffers are placed before tasks that feed into the critical chain to safeguard against delays in preceding tasks. Resource buffers ensure that critical resources are available when needed. These buffers serve as a protective mechanism, ensuring that the critical chain is not adversely affected by delays in non-critical tasks (Leach, 2000). Effective buffer management allows project managers to identify potential issues early and take corrective actions to keep the project on track.

Effective synchronization of tasks and reduction is important to project success. Another way of looking at it is that maintaining the tempo of a project is simply good management. Good managers ensure their people have the time, resources and cooperation necessary to move projects forward. Leaders manage flow, not feelings.

Strategies to reduce multitasking within project execution are crucial, as multitasking often leads to inefficiencies and increased project durations. CCPM promotes focused task execution, where resources are dedicated to a single task at a time, improving overall project flow by reducing time lost in task-switching (Jarvis, 2019).

It's often said that an hour lost on a bottleneck resource is an hour lost on the entire project,

(Ching, 2018). A bottleneck is the slowest step in any operation or system. Since this step is the slowest, it dictates the overall pace of progress. A bottleneck could be a process, person, a piece of equipment or even the availability of materials. Solving or overcoming a bottleneck inevitably leads to the discovery of the next one.

This principle underscores the need for prioritizing tasks and resources to address bottlenecks, ensuring that they do not disrupt the project flow. CCPM places a strong emphasis on aligning activities with the project's critical chain, necessitating a clear understanding of task dependencies and resource allocations (Newbold, 1998).

Addressing bottlenecks is essential in CCPM. Identifying and managing bottlenecks involves reallocating resources to clear them, adjusting task schedules to ensure effective use of bottleneck resources, and employing buffer management to absorb delays caused by bottlenecks (Layoyan, 2023). Project buffers placed at the end of the project and feeding buffers placed before tasks that feed into the critical chain protect the project timeline from delays. Effective buffer management allows project managers to address delays at bottlenecks without impacting the overall project schedule (Eby, 2022). Task prioritization in CCPM enhances flow efficiency. By prioritizing tasks based on their impact on the critical chain, resources can be allocated to

crucial areas, reducing the likelihood of bottlenecks and ensuring smooth project progression (Ching, 2018).

CCPM is a logical extension of TOC applied to project management. It means adopting an organization-wide culture change and/or individual mindset shift to integrate CCPM. It leverages TOC's core principles—identifying and exploiting constraints, subordinating other processes, and continuous improvement—to optimize project performance. By shifting the focus from individual tasks to the critical chain and using strategic buffers, CCPM addresses the inherent inefficiencies of traditional project management and significantly improves the likelihood of project success.

Relating the Five Steps of TOC to CCPM

Goldratt's Five Step Continuous Improvement Process is a fundamental framework within the Theory of Constraints that provides a systematic approach to enhancing organizational performance. When applied to Critical Chain Project Management (CCPM), these steps offer a structured pathway for optimizing project execution and ensuring successful outcomes. The chapters that follow will look into each of these steps, illustrating how they can be effectively implemented within CCPM.

The five steps in the TOC improvement process are as follows:

1. Identify the Constraint

Identifying the constraint in the context of CCPM translates to identifying the critical chain of dependent events that dictate the project's duration. The critical chain includes task dependencies and resource constraints that together form the project's bottleneck. Recognizing this chain is crucial as it determines the pace at which the project can be completed. Chapter 3 of this book focuses on how to identify the critical chain in a project, describing tools and methods that can help project managers pinpoint these constraints early in the project lifecycle.

2. Optimize the Constraint

Once the critical chain is identified, the next step is to exploit or optimize this constraint. This involves ensuring that the critical chain operates at maximum efficiency, which includes proper scheduling, resource allocation, and buffer management. Chapter 4 of this book discusses scheduling, buffers and the overall use of time in projects, providing insight into setting realistic task durations, establishing strategic project and feeding buffers, and employing scheduling techniques that align with the principles of CCPM to keep the critical chain unimpeded.

3. Subordinate everything to the Constraint.

In CCPM, subordinating processes to the constraint means aligning all project tasks and resource allocations to ensure they support the critical chain. This step often requires a cultural shift within the project team to prioritize the critical chain over individual task optimization. Chapters 5 and 6 in this book will outline strategies for nurturing this alignment, including team collaboration, communication, and workflow adjustments that ensure the entire project ecosystem supports the critical chain.

4. Elevate the Constraint

In CCPM, elevating the constraint might mean investing in additional resources, adopting new technologies, or implementing process improvements that enhance the flow in the critical chain. Elevation strategies include resource leveling, adopting advanced project management tools, and continuous training for project teams to improve their capabilities in managing and executing critical tasks. Chapter 5 of this book focuses on this elevation step in introducing Goldratt's Rules of Flow and relating them to the forestry projects that are often replicated in different locations and time periods.

5. Prevent Inertia from Becoming the Constraint and Repeat the Process

Preventing Inertia involves building a culture of continuous improvement and vigilance against complacency and continuing to use CCPM on future project. In practice this means regularly revisiting the project plan, monitoring performance, and being prepared to re-identify and address new constraints as they arise. Chapter 6 will discuss ways of maintaining this continuous improvement mindset and supporting widespread adoption of CCPM in a business, organization or agency. Repeating the process could happen in creating improvements in a single project but might more commonly be used in the next similar project.

Following Goldratt's Five Step Continuous Improvement Process, CCPM offers a useful framework for managing and implementing projects with greater efficiency, shorter timelines and reliable results. Each of the subsequent chapters will provide a deep dive into these steps, offering practical guidance and detailed methodologies for applying continuous improvement principles within the context of managing projects.

Reviewing the mention of the five steps of the TOC process and their place in this book:

Chapter 3 focuses on how to identify the critical chain in a project (TOC's Identify the Constraint).

Chapter 4 discusses scheduling, buffers and the overall use of time in projects (CCPM's version of subordinating everything to the constraint).

Chapter 5 introduces Goldratt's Rules of Flow and shows how they are used in both exploiting the and elevating the constraint.

Chapter 6 discusses the culture and mindset shifts needed in adopting critical chain project management (CCPM's version of preventing inertia from becoming the constraint).

WHY CCPM?

1. Faster Project Completion: `

CCPM helps reduce overall project timelines by focusing on critical tasks and avoiding delays through effective buffer management;

2. Improved Resource Utilization:

By considering resource constraints and availability early in the planning process, CCPM ensures optimal use of resources and minimizes conflicts;

3. Reduced Multitasking:

CCPM minimizes multitasking, allowing team members to focus on one task at a time, which enhances efficiency and productivity;

4. Enhanced Project Control:

CCPM provides better project monitoring through tools like fever charts and buffer management, offering real-time insights into project health and progress; and

5. Increased Adaptability and Flexibility:

CCPM allows for swift adjustments to changes and unexpected challenges, making the project management process more resilient and adaptable.

Would you like to see how CCPM is applied in a forestry setting? Let's check back in with Russ, the anxious forester from the story in the first chapter.

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Case Story – Forester Russ Joins the Chain Gang

Recall Russ, our state lands forester from the previous chapter. Russ's anxiety finally overwhelmed him, prompting him to seek a more rewarding career path. He realized he was taking a chance in making the move, as it might be more of the same if he stayed with the Bureau of Forestry. Nevertheless, he jumped at the opportunity to interview for a job in the Bureau's Private Land Services Division. This division was responsible for the state's Wise Use program, which encouraged landowners to commit to a professionally written forest management plan for timber production and other uses in return for a significant property tax break. Landowner commitments of this type make an important contribution to the state's timber supply and the rural economy.

Russ walked into his interview with the Private Lands Services Division's Leader, who immediately said, "*You can call me Baldy*." Taking off his hat, he added with a smile, "*I guess you can tell how I got that name.*" Russ

thought to himself, *"I could get used to working here"* Baldy's self-effacing grin was a refreshing change from Kara's sense of importance.

Russ knew he was among several candidates, including three internal applicants and one from private industry. He didn't think he stood a chance and was surprised when Baldy offered him the job the following week. Later he learned that his preparation and insightful questions during the interview were key reasons Baldy hired him. Baldy liked the fact that the interview was a two-way conversation, with both of them posing questions to one another.

In his first week, Russ underwent training with Penny, a forester he had briefly worked with in his previous job. The work culture here was markedly different; they were to accomplish much more than what Russ was accustomed to under his previous supervisor, Kara. When he timidly asked Penny how they got so much done, she smiled knowingly and said, "*We do things differently over here. You'll see*."

Russ learned that each task he took on had very specific deadlines. His role involved reviewing private land forest management plans written by consulting foresters, processing Wise Use applications from landowners, and maintaining regular communication with both the consultants and enrolled landowners. The program managed about 4,000 enrollments,

and tasks were divided among multiple staff members.

The program had fixed legal deadlines to correspond with local property tax assessing dates. Baldy had set earlier internal deadlines to create a buffer, allowing for more efficient management of the workload. These deadlines ensured that landowners didn't incur the expense of a management plan, only to learn they would have to wait another year to enroll.

Russ observed various efficiencies and inefficiencies among the consulting foresters. Some consistently submitted excellent work on time, while others were prone to delays and poor-quality submissions. Notably, a forester named Gert from a large land management company and another sole proprietor consultant named Barney were reliable and communicated effectively, making them preferable collaborators. Although he wasn't supposed to, Russ found himself subtly recommending these two consultants to the landowners who contacted him to ask about the state's Wise Use program.

Baldy's management style included built-in cushions that allowed for flexibility. This approach, along with what was eventually explained to Russ as Critical Chain Project Management (CCPM) principles, encouraged focusing on the most critical tasks and managing dependencies efficiently. Baldy

empowered his team in a way that Kara did not, much to Russ's relief.

Penny told Russ that things hadn't always been done that way. "*You should have seen this place when I first started here,*" she told him. "*What changed?*" Russ asked. Penny explained that Baldy enrolled in a Vermont Forest Business School program that he claimed, "*set his brain on fire.*"

"*Things got serious in a hurry here after that,*" Penny told him.

Baldy explained how his team did things with a bit of a mangled parable. "*If you want to go fast, go alone if you want to go far, go together. Someone smart said that but anyway, we do both.*" He went on to explain that their projects were like relays. We accomplish the big picture things together, he explained, but when it's your turn to run, the rest of us cheer you on and stay out of the way. "*Your turn happens almost every day, so remember that and plan for it.*"

Baldy also shared another bit of advice – "*Replicate, then iterate. That gym-bro Hormozi said that, and he is right. Copy how the others here do their work – you are all pretty much doing the same things – and once you master that you can start figuring out how to do it better the next time.*"

This led Russ to go and research more about Alex Hormozi. He wasn't sure which surprised

him more, that Hormozi was much more than a “gym-bro” or that Baldy took the time to learn from a person like him.

Russ appreciated this new style of working. Early coaching sessions introduced him to CCPM, explaining that the "critical chain" is the longest series of dependent tasks. This method minimizes unnecessary time buffers, ensuring that tasks are completed efficiently. Baldy told him that in most cases, the critical chain simply involved doing the hardest thing first. “*Not always,*” he explained, “*but often enough.*” He also explained that Russ should take this approach to his daily schedule whenever possible. For his part, Russ had never experienced this strange combination of coaching and hands-off management.

Early on in his time with the team, Russ found that he was going to be late in submitting a forest management plan to Baldy for final approval. Baldy told him this was okay as long as he had it in one week.

“*Try to make early submission a habit,*” Baldy told him. Later, Baldy asked him if the lateness was due to a late submission from the consulting forester, and Russ sheepishly admitted this was the case.

“*You'll figure out how to fix that,*” Baldy told him.

Baldy emphasized that their work would reflect well on the state and its role in supporting and encouraging private forest stewardship. This environment, focused on critical tasks and efficient work practices, was a significant change from Russ's previous experiences, and he found it increasingly satisfying as he adjusted to the new norms.

After two months in his new job, Russ awoke one day to realize his anxiety about his career was gone. While he didn't exactly miss his old job, he had to admit that the learning opportunities Kara used to send her team were sometimes appealing. Baldy never did this. When Russ heard about a forest carbon measurement workshop that he thought was particularly interesting, he submitted a formal request to Baldy to attend.

Baldy stopped by his desk later that day and asked if he was on top of his work. Russ told him he was. "*As long as it won't make you late on any deadlines, go ahead and attend that workshop,*" Baldy told him.

A few weeks later, he saw an upcoming webinar on timber trespass that he thought was worthwhile, so he forwarded it to Baldy and asked for permission to sign up for it. Baldy emailed him back a brief reply: "*IDGAF. You don't need to keep asking my permission for these things. Do your work on time, and you can attend anything you like.*"

Later Russ asked Penny about Baldy using "IDGAF" in a state email account. She laughed and told him he does it all the time. *"One time the higher ups gave him a talking to about it and he acted puzzled and made them spell it out for him. He feigned surprised and explained that IDGAF stood for I Do Grudgingly Agree Formally*." She added that she had also heard him explain it as "I Do Graciously Accept as Forestry."

Russ had found his new home as a forester.

Key Points Highlighting CCPM Principles:

1. Built-in Buffers: Baldy's practice of setting internal deadlines earlier than legal ones creates buffers, a key CCPM principle.

2. Task Prioritization: The focus on doing the hardest tasks first reflects CCPM's emphasis on managing the critical chain.

3. Empowerment and Flexibility: Baldy's management style of not requiring permission for professional development encourages self-sufficiency and aligns with CCPM's approach to autonomy with expectations for delivery.

4. Addressing Dependencies: Russ's adjustment to managing dependencies and understanding their impact on his schedule illustrates CCPM's focus on dependencies and resource constraints.

"Barney hopes that Burt won't prove to be a petty tyrant. In his experience, those types like to be the heads of committees."

Chapter 3. Identifying the Critical Chain

Before we can identify the critical chain in a project, it is probably a good idea to define the term. The critical chain in the project is the longest sequence of dependent tasks that determines the overall project duration, incorporating both task dependencies and resource constraints.

The critical chain is any project's primary constraint and controls the rate of progress. Elder explains that the critical chain is derived from the critical path, which is the sequence of dependent tasks that determines the project's duration. The critical chain extends this concept by including both task dependencies and resource dependencies, making it a more comprehensive approach. Once the dependent events are identified, we can look at scheduling in the context of probabilities of dependent events. With this definition in mind, we can talk about figuring out what the critical chain is in any project.

Allan Elder provided great insights on identifying the critical chain in a project in an appearance on the Project Management Podcast with Cornelius Fichtner (2013). Elder emphasized the importance of understanding the Theory of Constraints and its application to project management. He highlighted the point that in traditional project management, the focus is often on individual tasks and their timely completion. Local optimization can lead to inefficiencies and delays in the project. By contrast, CCPM shifts the focus to the global optimization of the entire project. This involves identifying the longest chain of dependent tasks and resources, which forms the critical chain. The critical chain becomes the focal point for managing the project's schedule and ensuring timely completion.

The first step in this is to identify all of the project activities and then their dependencies. In forestry, we often do simple projects that are a repeat of something we've done somewhere else. We may experience déjà vu in our projects – that or the sense that it is a movie we have seen before. It's not difficult to identify the critical chain when we do a familiar project in a new situation.

You can probably make a quick list of all of the items that usually occur, but the more complicated the project the more things that can go wrong and the more interdependencies exit. It's worth taking the time to talk them over with

clients, team members and stakeholders, write them down, and flesh them out so that you understand how one thing leads to another throughout the flow of the project. Often enough this requires some thought and reflection over several days.

Start with a simple list, including every task necessary for project completion. Chances are you can get 80% of the tasks needed in this initial list. Give yourself time to reflect on this before taking the next step. If the project is entirely new to you, seek out input from others and try to work backwards from a similar completed project to itemize details.

Elder explains that the identification process begins with a detailed analysis of the project tasks and their dependencies. This analysis helps in pinpointing the project's path, which is then adjusted to account for resource availability and constraints. The result is the critical chain that will provide a realistic view of the project timeline, factoring in potential resource conflicts and delays.

Once most or all of the tasks are listed it is time to identify the dependencies among them. In mapping these connections, chances are you will think of items you missed in the initial list as part of this process. Mapping out dependencies might be as simple as drawing a series of arrowed lines on your list that connect interrelated items.

With this draft project map in hand, start fresh to diagram the critical chain in the most straightforward manner you are comfortable with. A simple internet search will provide you with online diagram options or spreadsheet templates. Alternatively, map it all out on a large piece of paper.

Once you know these dependencies, you can start to figure out how to set things in motion so that everyone has everything they need when it becomes their turn to run with some aspect of the project. Often enough in smaller forestry projects you are only managing yourself and your time. This does not mean that you won't have dependencies from someone who is outside the organization or who isn't even thinking of themselves as contributing to a project but just as someone who interacts with you from time to time in their work. As long as you know the interdependencies and the timing, you can get this critical chain figured out.

If you are in doubt about the order needed in the critical chain, put the hardest tasks that don't have any precursors first. As Mark Twain once said *"If it's your job to eat a frog, it's best to do it first thing in the morning. And if it's your job to eat two frogs, it's best to eat the biggest one first."* This is good life advice and often enough it is applicable to projects.

Figure out how long it will take to do each step. If we want to do this in a way that doesn't inhibit

flow, using a 50% confidence level is the CCPM suggestion. In general, cut the time you would normally allocate to each task in half.

In many situations, when asked how long something will take, if we want to be really certain something's going to be done on time, we will probably put a wide range on the time and know it will fall somewhere in there. This wide range is effectively a confidence interval. But in critical chain project management, we don't want to build this much buffer into each step because inevitably it will get used because of Parkinson's law and the student syndrome.

Instead, we'll use a 50% confidence level. We will ask how long it takes to get a task done with a 50% certainty of completion. This means the person responsible for the task is somewhat certain they can get the task done on time, without adding the extra time that makes them completely certain of finishing it.

The next step is to consider resource constraints. Assess the resources needed for every task and ensure the schedule accommodates resource availability without conflict. The task itself is one thing, but you might need supplies or certain equipment. Often enough there are competing uses for staff time or equipment in your organization or business.

You might need the availability of certain experts or specialists inside or outside your

firm. Their availability may be the key to moving your project forward. Perhaps the budget is the limiting resource, and you have to make sure that you will have enough funds to buy the materials you need at the right time. Maybe it's a question of ordering materials and being aware of how long it will take to get them shipped and in hand so that the project can move forward.

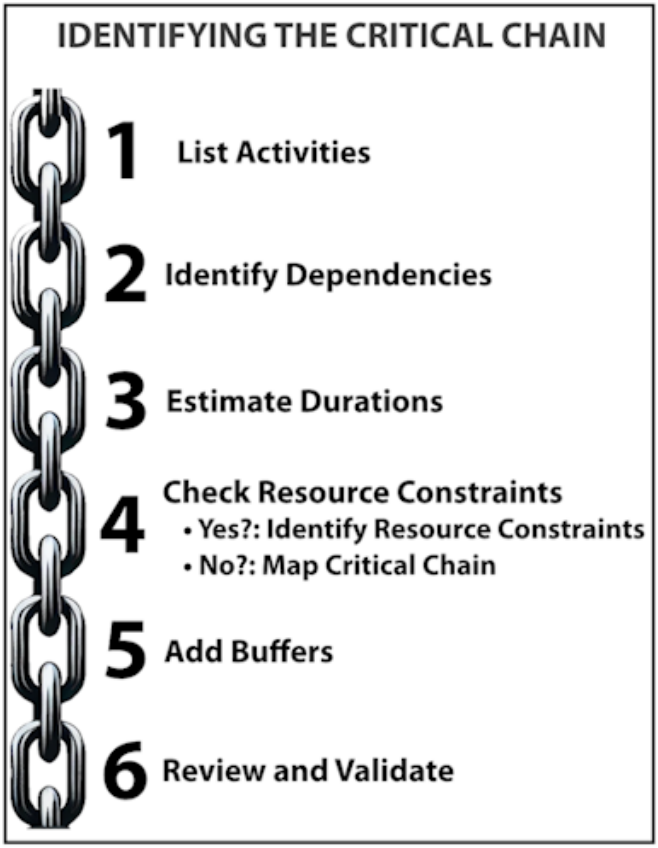
Once you have all this information, you can determine the critical chain, identifying the longest path that accounts for both task dependencies and resource constraints. Some of the tasks and interdependencies are going to be on that critical chain and some others are going to be considered feeders to this chain.

While they might be important, feeders are not going to be something that could hold up the critical chain. It's worth taking the time to map out feeding steps visually and use this information to communicate with your team members. Even when you are a one-person operation and few people are involved in the project, the act of mapping this out will serve to cement it in your head as the procedures necessary to move forward. If you have done a similar project over and over again, perhaps this is already in your mind, and you just need to fill in the blanks.

Elder also emphasizes the importance of managing buffers along the critical chain. These

buffers are strategically placed to protect the project from delays. He mentions that the project buffer at the end of the critical chain acts as a safeguard against uncertainties and variations in task durations. By focusing on the critical chain and managing the associated buffers, project managers can ensure that the project progresses smoothly and is completed on time.

Continuous monitoring and adjustment are necessary in managing the critical chain – particularly for those items performed outside the dual manager/technician role played by many of us in forestry operations. Elder suggests that project managers should regularly review the status of tasks and the consumption of buffers to identify any potential issues early. This proactive approach allows for timely interventions and adjustments, ensuring that the critical chain remains unimpeded, and the project stays on track. Be careful to walk the fine line between being engaged and being overbearing.


IDENTIFYING THE CRITICAL CHAIN
1 List Activities
2 Identify Dependencies
3 Estimate Durations
4 Check Resource Constraints
• Yes?: Identify Resource Constraints
• No?: Map Critical Chain
5 Add Buffers
6 Review and Validate

How do we figure out the critical chain of a forestry project? It's time you met Barney, one of the consulting foresters mentioned in state forester Russ's story in the previous chapter.

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Case Story: Barney and Critical Chain in a Forest Management Plan

Barney is a consulting forester who is considering an assignment to write a comprehensive forest management plan for a 160-acre property owned by a hunting club. The club has five owner-members. The property includes five distinct forest stands and one 9-acre open wetland. As a group, the club has a complex dynamic, with members who have varying levels of involvement and occasional rivalries.

Before Barney can quote a lump sum price for the plan and reach an agreement to do the work, he needs to determine the critical chain of the project to accurately estimate the time and resources required. The plan must be completed in two months to meet the deadline for enrolling the property in the state's Wise Use valuation program. This enrollment will provide significant tax savings to the landowners and saving money is one thing they all agree on.

Initial Meeting with Club Members

Barney meets with all the club members on a Saturday at their hunting camp on the property to discuss the project. This initial meeting is crucial for understanding their goals and the dynamics of the group. At this meeting Barney meets all of the owners, including:

- Paul: A vocal member with strong opinions, often at odds with other members, particularly Peter. Barney quickly realizes that managing Paul's expectations and keeping him focused on the project will be challenging.
- Peter: Another influential club member who loves clashing with Paul over every decision the club makes. Peter's competitive nature and desire to assert his ideas could create conflicts during the planning process.
- Bob: The peacemaker of the group, Bob helps facilitate discussions and mediate conflicts. Barney finds Bob's practical approach and willingness to compromise invaluable for moving the project forward.
- Ed and Larry: The two older members of the club, Ed and Larry, prefer to leave the decision-making to the others as long as the outcomes are beneficial. They are content with the

tone of the discussion but occasionally interject with amusing and tangential stories about past hunting experiences. Most of all they want the Wise Use program enrollment done on time so their contributions to the annual property taxes will be lower.

During the meeting, Barney steers the discussion away from hunting stories and past logging operations on neighboring properties. Instead, he focuses on understanding the owners' goals and ensuring they are all on the same page regarding the management plan's requirements and timeline. At the end of the meeting, he gives them a firm commitment to submit a price for the management plan by the following weekend. In return he gets the club's pledge to give him a timely commitment to proceed.

One outlier in the usual process is that Barney learns he will be required to consult with a guy named Burt who is not a member of the club. Burt is an adjacent landowner and more importantly the chairman of the cooperative road committee the club belongs to. Several landowners share the maintenance of a gated 10-mile road used to access their properties

Burt's permission is needed for approval of road use for future harvesting work on the property, all of which must go into the management plan

work schedule. Barney hopes that Burt won't prove to be a petty tyrant. In his experience those types like to be the heads of committees.

Identifying Critical Tasks and Dependencies

Barney begins by breaking down the project into critical tasks and their dependencies:

1. Initial Property Assessment:

- Walk the property to understand its current state.
- Identify and map the five forest stands and the open wetland.
- Assess accessibility and terrain operability challenges.
- Understand the owners' goals and practical aspects of interacting with them.

2. Data Collection:

- Perform a detailed inventory of each forest stand, including timber volumes, species composition, basal area, age classes, and health assessments.
- Note access issues and stand characteristics that impact forest operations potential.
- Evaluate wildlife presence and habitat quality.
- Observe any important natural or cultural resources.

3. Stakeholder Consultation:

- Discuss goals and objectives with the hunting club members (some of this came in the initial meeting and he plans to continue the discussion in an email thread).
- Review regulatory requirements and environmental guidelines.
- Consult with natural and cultural heritage databases for best practices and requirements.
- Consult with the road committee chairman to gain approval for harvesting schedules.

4. Developing Management Prescriptions:

- Create specific management strategies for each forest stand.
- Develop protection policies for the wetland area.
- Integrate wildlife habitat improvement measures.

5. Drafting the Management Plan:

- Compile all collected data and management prescriptions.
- Draft the plan ensuring it meets the club's goals and regulatory requirements.
- Review and revise the draft with feedback from the members, with a particular emphasis on managing their

expectations about enacting harvesting prescriptions.

6. Finalizing the Management Plan:

- Final review and approval from the club members.
- Prepare implementation guidelines and schedules.
- Submit the plan to the state agency for review.

Critical Chain Identification

Barney determines the critical chain by focusing on tasks and dependencies that directly impact the project's timeline and cannot be delayed without affecting subsequent tasks:

1. Initial Property Assessment: This task is foundational and provides the baseline information needed for all other tasks.

2. Data Collection: Accurate and comprehensive data collection is essential for developing effective management prescriptions. This task is dependent on the initial property assessment.

3. Stakeholder Consultation: Gathering input from the club members and reviewing regulatory requirements ensures the plan meets all necessary guidelines.

4. Developing Management Prescriptions: This task relies heavily on the data collected and forms the core of the management plan.

5. Drafting the Management Plan: Compiling the data and prescriptions into a cohesive plan is critical. Feedback and revisions must be managed efficiently to stay on schedule.

6. Finalizing the Management Plan: The final approval process is dependent on the timely completion of all previous tasks.

Managing Potential Difficulties

Barney recognizes potential difficulties and incorporates strategies to mitigate them:

1. Weather Delays: Barney plans buffer days to accommodate potential delays due to rain or other adverse conditions during the data collection phase.

2. Access Issues: During the initial property assessment, Barney identifies and plans for challenging terrain and access points.

3. Stakeholder Availability: Scheduling meetings with the club members and ensuring their availability for feedback and approval is crucial. Barney allocates extra time for these consultations, knowing that at least one member may raise issues late in the process. He can also see that an argument among the members is inevitable, and he must build time in his work schedule for it.

4. Road Approval: Barney consults with the road committee chairman early in the process to ensure there are no delays in gaining approval

for the harvesting schedule. Burt proves to be responsive but is quick to tell Barney he has veto power over use of the road by logging traffic. Barney later finds peace of mind when he studies the deeded right of way to the property among a sheaf of otherwise useless old papers and maps the club members gave him. As it turns out, the road committee chairman has no real power over use of the road, and Barney can demonstrate legal roadway access in the Wise Use application to the state agency.

Time and Cost Estimation

Barney uses his critical chain analysis to estimate how much time each task will take, including buffers for potential delays. This allows him to determine the total time required for the project and give the hunting club owners a firm lump sum price for completing the project, payable upon submission of the final draft of the management plan to the state agency. He is comfortable establishing narrow windows for the things within his control (such as his focus and effort on tasks he has done many times in the past) and adds more potential time for the things he cannot control (such as weather and the temperaments of the various landowners).

In the end Barney arrives at a lump-sum price that will allow him to profit from the job. It is also a price that is competitive enough, considering the upcoming deadline, that he

should get timely approval to proceed from the landowners.

Barney puts this all in a letter that is emailed to all five landowners. Just in case, he informs them that if he is going to meet the deadline, he will need approval in no less than one week and as an added safeguard he insists that they appoint one of their group to be his primary contact. Even though Barney anticipates a heated battle between Peter and Paul over semantic details of the plan, he is comfortable he has accounted for the time that will be spent on reaching a compromise in his price quote.

Key Lessons from Barney's Critical Chain Story:

Barney's story brings to light several lessons in the process of identifying the critical chain of a project. These lessons, listed below, are important both in the eventual execution of the project and in assembling a price quote for the work.

1. Understanding Stakeholder Dynamics: Recognize and manage the expectations and dynamics of all stakeholders to ensure aligned goals and cooperation. Barney got a good initial read on the Peter and Paul situation and the inclinations of the other three landowners.

2. Identifying Critical Tasks and Dependencies: Focus on foundational tasks like initial property assessment, data collection, and stakeholder

consultation, as these form the core of the project.

3. Buffer Management: Incorporate buffers for potential delays due to weather, access issues, and stakeholder availability to keep the project on track.

4. Resource Management: Accurately estimate and allocate resources to avoid bottlenecks and ensure the availability of key resources for critical tasks.

5. Time and Cost Estimation: Barney uses critical chain analysis to create realistic time estimates and cost projections, balancing controllable and uncontrollable factors.

6. Project Execution and Flexibility: Proactively manage potential difficulties (such as Burt, the Road Committee chairman) and adapt to changes to maintain project flow and avoid disruptions.

By focusing on stakeholder dynamics, critical tasks, buffer management, resource management, realistic time and cost estimation, and maintaining flexibility, Barney can efficiently price and manage the forest management project, ensuring timely and successful completion.

“On the morning of the Cutbank session, a garbage truck hit a utility pole, causing a widespread power outage, and the office was closed. Zane called Nessa early that morning in a panic."

Chapter 4. Timing Tasks and Buffers

If the longest series of dependent events in a project is the primary constraint, subordinating everything to that constraint is done in scheduling events and allocating time and resource buffers for their completion. More precisely this means ensuring that everyone involved in project activities understands how scheduling and the use of time establish priorities for the completion of tasks that move the project toward completion.

Elder's insights on buffers in CCPM provide a comprehensive understanding of how to strategically employ buffers to safeguard projects against uncertainties and ensure timely completion (Elder, 2013). Critical Chain Project Management’s roots in the Theory of Constraints mean it is designed to overcome common pitfalls like delayed timelines, overblown budgets, and poor resource allocation.

There are three primary types of time buffers used in projects:

- Project Buffers: Placed at the end of the project timeline, these buffers protect the project's delivery date from delays on the critical chain (Eby, 2022);
- Feeding Buffers: These buffers are inserted where non-critical paths feed into the critical chain, preventing delays in supporting tasks from affecting the main project timeline (Leach, 2000);
- Resource Buffers: Positioned along the critical chain, resource buffers ensure that necessary resources are available when needed, preventing resource-related delays (Leach, 2000).

In CCPM, buffers are essential protective time, or budget margins to account for uncertainties and delays. CCPM addresses the potential for delays by aggregating individual buffers into strategic project buffers and feeding buffers, thereby reducing overall project time while maintaining adequate protection against delays (Elder, 2013). Absent this approach, task owners add their buffers to ensure timely completion, resulting in bloated schedules.

Buffers are integrated into project schedules to absorb uncertainties and variabilities in task durations. Predictions about our work and how long it will take are subject to unanticipated hold ups. That is why when we are asked how

long something will take, it is natural to quote a longer window of time than is usually necessary.

Buffer management plays a crucial role in maintaining project tempo. By strategically placing buffers at different points, such as at the end of a project or before critical chain tasks, project managers can protect the schedule from delays (Goldratt-Ashlag, 2023).

Effective buffer management helps maintain a steady project tempo in the following ways:

- Absorbing Variability: Buffers handle uncertainties and variabilities in project schedules, preventing minor delays from affecting the project's overall timeline (Goldratt-Ashlag, 2023);
- Prioritizing Tasks: Buffers assist in prioritizing tasks by highlighting the ones that need immediate attention to keep the project on track (Leach, 2000); and
- Maintaining Momentum: Careful buffer management ensures that delays in non-critical tasks do not halt the progress of critical chain tasks, maintaining a steady flow (Scherer, 2011).

Buffers help achieve a consistent and controlled progression in maintaining project tempo. Momentum is perishable and time is lost in start-stop work patterns. Buffers help maintain project tempo by:

- Steady Flow: Buffers ensure a stable flow of project activities, preventing bottlenecks (Hoban, 2023).
- Adaptability: By reassessing and reallocating buffer time, project managers can adapt to changes without disrupting the project's rhythm (Hoban, 2023).
- Predictability: Buffer management allows project managers to anticipate delays and adjust resources, maintaining a predictable project timeline (Goldratt-Ashlag, 2023).

Optimizing buffer usage is essential for keeping project schedules intact. This is done by monitoring, reallocating time and resources and adjusting:

- Monitoring Buffers: Regularly monitoring buffer usage helps project managers anticipate potential delays (Goldratt-Ashlag, 2023);
- Reallocating Buffers: Adjusting buffer allocation based on current project progress ensures resources are used efficiently (Leach, 2000);
- Agility in Adjustments: Being agile in buffer adjustments keeps the project tempo aligned with planned timelines (Leach, 2000).

Suppose you are working with three team members who all make needed contributions to

the critical chain on a project. They may or may not know that you are managing a project or what the end product will be – often people just know you need something from them. If you ask them when they can complete a work item, they will usually quote a completion date that ensures they have time to get it done. Suppose the task only takes two hours of focused work, but they tell you they can get it to you in a month? This is just their way of making sure they can get it done and of signaling that their other work is important.

What metric did they use in arriving at a completion date? Chances are they thought about the soonest date they could get it done and then looked at a worst-case date as well. This window is known as a confidence interval and people usually quote the end date of a window in which they are 90% certain they will be done.

By using narrower confidence intervals, CCPM significantly shortens project durations. Traditional methods often use the conservative estimates we just discussed to ensure on-time delivery. This paradoxically leads to delays and inefficiencies (think back to the Student Syndrome and Parkinson's law). CCPM's approach reduces the time allocated to individual tasks, pools the reduced buffer time at strategic points, and encourages immediate attention to critical tasks without waiting until the last moment (Elder, 2013).

This approach of shortening task windows has been mentioned several times so far in this book, but it bears repeating. Instead of the end date of any time window that means we are 90% sure a task will be done, CCPM uses the end date of a window in which we are 50% certain the task will be done. As Elder notes, the Student Syndrome demonstrates that people are really good at actually knowing how long something will take them because they can identify the last minute to start. In practice this is done by cutting the traditional delivery window in half (and by more than half in specific situations when you know things can be done sooner). Ideally, we want people to use the last-minute urgency so many of them are accustomed to, but instead of using it when there is little time left, we want it as the start of the new and narrower time window for completion.

You must be the judge of when to impose a schedule or when to ask team members to impose it on themselves. It is important to encourage early delivery and emphasize the lack of penalties for late delivery. Some late deliveries will inevitably occur (remember we are only 50% certain of completion), but by placing all of the time buffer that used to be given to tasks into the overall project buffer, we have extra time to use when needed. In effect, we are putting all the extra buffer time into a bank that we only call upon if necessary.

In forestry we are sometimes designated project managers but often enough we are just people trying to cooperate with others to move projects forward. In this sense our responsibilities outstrip our authority. We might not have the power to impose the schedules on others that are needed to get things done. What we lack in authority we must make up for with positive influence. Managers, coworkers, and outside contractors can leverage buffers to maintain steady progress and avoid bad multitasking. How is this done?

- Single-task Focus: Assign workers to single tasks on the critical chain to avoid bad multitasking, ensuring they are fully dedicated to completing their task efficiently without distraction. When busy professionals are working on multiple projects, the single-task focus should be brought to bear on the most productive window of their day;
- Task Prioritization: Use buffer management to prioritize tasks. Tasks on the critical chain consuming more buffer than planned receive immediate attention, ensuring they do not delay the project;
- Resource Allocation: Ensure resources are available when needed by placing resource buffers strategically. This prevents work stoppages and keeps the project on track; and

- Progress Monitoring: Monitor time consumption regularly. If a project is consuming its buffer time too quickly, it indicates potential delays that need addressing. Conversely, if buffers are underutilized, it may suggest opportunities to accelerate the project.

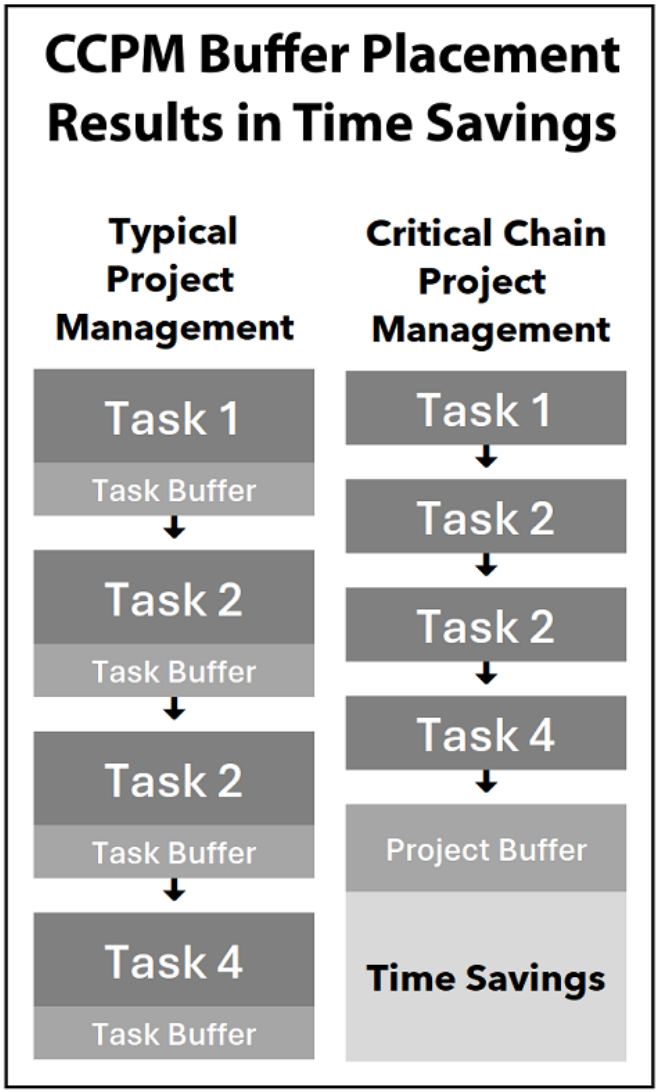
By focusing on the critical path and employing strategic buffers, CCPM addresses the root causes of project delays and inefficiencies. CCPM's innovative use of time provides a significant improvement over traditional project management techniques. The shift to narrower confidence intervals and the aggregation of buffer time result in shorter project durations and higher success rates.

You don't need a project manager title to use CCPM. Managers, team leaders, coworkers and even sole proprietors who work with others can use CCPM principles to maintain continuous progress, avoid bad multitasking, and deliver projects on time and within budget. With CCPM, projects are more efficient and also more resilient to the uncertainties that typically plague project timelines (Elder, 2013). Shorter durations are better for all of the reasons discussed back in the first chapter of this book.

The strategic use of buffers transforms project management from a reactive to a proactive discipline, driving success in complex and dynamic project environments (Goldratt-

Ashlag, 2023; Leach, 2000; Scherer, 2011; Hoban, 2023). By incorporating these principles, CCPM enhances the effectiveness of project management, ensuring that tasks are completed on time, resources are optimally allocated, and project goals are achieved efficiently.

The CCPM approach to scheduling project tasks involves cutting the work window for each item in half and then placing the time removed from each task into the safety buffer for the end of the project. In this way the project is sped up by any critical chain task that finishes early, and team members are discouraged from using up project time unnecessarily.


CCPM Buffer Placement Results in Time Savings
Typical Project Management
Task 1
Task Buffer
Task 2
Task Buffer
Task 2
Task Buffer
Task 4
Task Buffer
Critical Chain Project Management
Task 1
Task 2
Task 2
Task 4
Project Buffer
Time Savings

How does this CCPM scheduling and buffering play out in forestry projects? A look at a training project for forest carbon measurements shows this approach in action.

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Case Story: Nessa Organizes Forest Carbon Measurements Trainings

Nessa is the state DNR's climate forester. The DNR Chief tasked her with developing and organizing a comprehensive training program on forest carbon measurements across the state's four regional forestry offices. All future state forest inventories are required to make carbon measurements, and this training program is an essential part of implementing this requirement.

Nessa will personally lead the training sessions, drawing on her extensive knowledge and experience in forest and tree carbon field measurements. However, she needs the cooperation of each regional forester to ensure their staff attends the sessions. Additionally, she has arranged for two guest speakers at each location to provide expert insights. One speaker will cover the state's general forest inventory standards and the other will discuss safety issues.

The first training session is scheduled at the Chinook Regional Office, which will set the stage for the remaining three sessions. Nessa has

strategically planned this session to occur at least two weeks before the others, allowing ample time to adjust the content based on the feedback she receives. She has coordinated with Kyle, the regional forester at the Chinook office, who is enthusiastic about the program and has assured Nessa of full attendance from his staff.

Nessa has had people drop the ball on scheduling items in the past and she is planning to use some of the CCPM scheduling methods she learned in a Vermont Forest Business School short course she attended remotely over the winter. Her main motivation for enrolling was the continuing education credits and so she was pleasantly surprised by how much she enjoyed the actual training.

She identifies potential resource constraints, including the availability of regional foresters and two guest speakers. To mitigate these constraints, she includes resource buffers, ensuring key participants are available when needed.

Nessa reached out to Kyle as soon as she knew she had this assignment, promising to follow up with details soon. She chooses to go to his regional office first because she believes this will be the best opportunity to fully figure out the process. Kyle is known for his attention to detail, and he helps Nessa address logistical challenges, ensuring the necessary resources are in place. If anything didn't go as planned in

Chinook, she knew she could count on Kyle to adjust on the fly.

One overriding constraint to the project is the need to complete all training sessions before the spring fieldwork season begins. This tight timeline adds pressure to Nessa's planning. This constraint supplies the end completion date for all of the training – April 1 on her calendar.

Of the two guest speakers, the state mensurationist is the only essential one. There were multiple people who could do the safety training, but Blake the mensurationist was the only one who could explain how the new forest carbon measurements would be incorporated into the existing measurement standards. For this reason, she went to Blake first to get a list of dates he was available through later March and then gave these dates to the regional offices to choose from. With their choices in mind, she contacted four people that could potentially do the safety training. In the end she needed three different safety speakers to cover the four dates.

The last scheduling detail was arranging for lunch at each location. Nessa didn't really think this should be the job of the climate forester, but in the past when she had left it to the regional offices to take care of, they didn't seem to think it was their job either and when she left it to them, lunch came late, and no one was happy. She decided to contact the administrative staff

in each regional office to ask for their recommendations about a restaurant that would deliver. She arranged to have pizza and salads delivered at each location and brought along cases of water for drinks. Since she was unsure how many people would attend, she ordered as much as she could get and still stay within the budget. Having extra pizza to share at the regional office might buy her goodwill toward future events in each region.

The first training day in the Chinook office was well organized and took place on March 2nd. The morning began with a classroom session where Nessa and the guest speakers introduced the principles and techniques of forest carbon measurements, general measurement standards, and safety practices. After this informative session, lunch was provided, giving participants an opportunity to network and discuss the morning's content informally. In the afternoon, everyone headed out to a nearby state forest for a hands-on site visit. Nessa led the group in practical exercises, demonstrating how to measure carbon in various forest stands.

Kyle had left it to one of his staff to choose the site and it turned out to be less than ideal. In fact, it was only when they were organizing the carpool after lunch that Kyle's staffer decided on a site. Since she had two weeks to work with, Nessa wrote a list of site requirements that evening after the workshop and sent them to the other regional foresters. She requested they

pick suitable sites in advance, telling them she would need locations ahead of time so she could include maps in the training materials.

For the subsequent sessions at the Shawmut, Onekio, and Cutbank Regional Offices, Nessa follows a similar structure. She worked with regional foresters—Ellen in Shawmut, Clyde in Onekio, and Zane in Cutbank—ensuring they had their teams ready for the training. Ellen is known for her organized approach and has already arranged all logistics, while Clyde, though initially a bit laid-back, has been persuaded to take the session seriously by Nessa's persistence. Zane, being relatively new, is eager to make a positive impression and provides enthusiastic support. He peppered Nessa with emailed questions, and she felt reassured he would be ready in his own nervous way.

The Shawmut and Onekio sessions happened without a hitch. On the morning of the Cutbank session, a garbage truck hit a utility pole, causing a widespread power outage, and the office was closed. Zane called Nessa early that morning in a panic. He was overly apologetic about something outside his control. Nessa then played her buffer card – they would reschedule the training for the following week, on March 29th. She knew everyone was available that day and the project would then be completed on time. Zane sighed in relief. He'd

forgotten that she had cleared that day with him a month ago.

Nessa's careful planning and the cooperation of the regional foresters and guest speakers ensure that the training sessions are a complete success. The staff at each regional office leaves with a deeper understanding of forest carbon measurements and better equipped to contribute to the state's stewardship goals before the busy spring fieldwork season begins.

Key Lessons from Nessa's Forest Carbon Measurements Training Scheduling:

1. Stakeholder Coordination: Early engagement with key stakeholders (e.g., regional foresters and guest speakers) ensures their availability and cooperation, which is crucial for scheduling and resource allocation. Nessa does this by reaching out to regional forester Kyle and then again by contacting the other three regional forestry offices.

2. Resource Buffering: Including resource buffers to ensure the availability of essential participants, such as the state mensurationist, helps mitigate potential scheduling conflicts and ensures critical tasks can proceed without delay.

3. Critical Adjustments: Scheduling the first session at Chinook two weeks before the others allowed time for adjustments based on

feedback, ensuring subsequent sessions are optimized and any issues are resolved early.

4. Logistical Planning: Proactive logistical planning, such as arranging lunches and site selections, avoids last-minute disruptions and ensures smooth execution of training sessions. Similarly, Nessa's quick adjustment when the first field work site was sub-optimal ensured that this wasn't repeated in the next three sessions.

5. Managing Constraints: Identifying and managing overriding constraints, such as the need to complete training before the spring fieldwork season, provides a clear end date and helps prioritize tasks accordingly.

6. Buffer Management: Using time buffers to account for unforeseen events, like rescheduling the Cutbank session due to the power outage, ensures the project can still meet its deadlines.

By coordinating with stakeholders, including resource buffers, adjusting activities based on feedback, proactive logistical planning, managing constraints, and using time buffers, Nessa successfully organizes and executes the forest carbon measurements training sessions on schedule.

"Trevor notices that the sawmill's efficiency drops significantly when the flow of logs from the timberland is sporadic, something that has been increasingly common with the poor weather they have experienced for the last two years"

Chapter 5. Project Flow

If the longest series of dependent events is the bottleneck of a project, ensuring flow is how this constraint is exploited and elevated. While we usually think of "exploiting" as a bad thing in resource management, in Eliyahu Goldratt's TOC world exploiting simply means "to make full use of." Elevating the critical chain could take place in the current project or in future projects of the same or similar type.

Goldratt's first introduced the use of TOC in project management to the world with the business novel *Critical Chain*. Knowing that he needed to do more to advance the critical chain concept, Goldratt developed the Rules of Flow for project management.

Goldratt's Rules of Flow is a business novel published in 2023 and written by Elfrat Goldratt-Ashlag, Eliyahu Goldratt's daughter. This book provides actionable principles to

ensure seamless project progression and shows how they are applied in realistic work situations.

The Rules of Flow are a necessary part of applying CCPM, providing guidelines to maintain progress along the critical chain, even in the face of Murphy's Law, which posits that anything that can go wrong will go wrong.

The Eight Rules of Flow are as follows:

1. Avoid bad multitasking; control your work in progress (WIP).

2. Verify full-kit before you get going.

3. Triage to ensure you are working on the right priorities.

4. Ensure synchronization between your tasks, people, and resources.

5. Increase the dosage if you aren't getting desired results.

6. Avoid unnecessary rework by finding what causes it.

7. Standardization is recommended when improvising is costly.

8. Abolish local optimum; global optimum is what matters.

Explanations of each of these rules follows.

Multi-Tasks Hold Others Back

Follow this rule by focusing on critical work items others are waiting for and only engage in work on other projects when no one is waiting for you to hand something off. The formal Rule of Flow on this topic is *"Avoid bad multitasking; control your work in progress (WIP)."* Multitasking often leads to inefficiency, with the "task-switching penalty" resulting in longer completion times and higher error rates.

For example, a custom sawmill will have decreased efficiency if it simultaneously tries to fill portions of multiple lumber orders. A day spent in this way might result in no orders being completely filled. This situation shows the drawbacks of uncontrolled multitasking, a common problem in all forms of production.

This rule is most important in situations when multitasking leads to delays or errors in critical chain activities, affecting overall workflow. Bad multitasking often cloaks inefficiency with a veneer of busy-ness. The distinction between productive and counterproductive multitasking is important. While engaging in multiple tasks can sometimes be beneficial—such as combining educational audio content with physical activities—it often diminishes focus and efficiency in critical project tasks.

Many people maintain that true multi-tasking is impossible and what really happens is people

are constantly switching between tasks and projects. The loss of momentum involved in doing this is where the true costs are created. Each task takes longer than it might have. This increases costs and causes some work to be late.

The reality of most forestry work is that we are leading or participating in multiple projects at any given time. It is unnecessary to devote equal amounts of time to each one because flow rates will vary. Figuring out the tempo of each project means knowing when your tasks are the ones that others are waiting on with the most immediacy. Spring when you are called upon.

Your role as a project manager is central to managing WIP effectively. You are tasked with prioritizing tasks wisely, allocating resources, and ensuring that projects receive necessary attention at the right time. This involves maintaining a clear overview of all ongoing projects, understanding each stage, and communicating progress with team members effectively. Visual aids are helpful in this, even something as simple as a carefully marked up calendar.

A disciplined approach to multitasking is necessary. Place your focus on critical work items that others are waiting for, and engage in other tasks only when it doesn't impede the progress of more urgent ones. Make sure team members do the same. This approach aligns with lean management principles, aiming to

minimize waste of time and effort and maximize value-added work.

If multi-tasks hold others back, it follows that careful task prioritization is necessary. Understanding the optimal number of tasks that are underway at once for maintaining proficiency in your work ensures project flow. This is good for cost efficiency, quality, workplace morale, and ultimately, the successful completion of projects.

Kit Ready, Work Steady

To avoid delays, verify that all the necessary tools, supplies, resources and people are lined up, in place or readily available before you start the project. The formal rule states *"If you don't want to get stuck, verify full-kit before you get going."* This rule emphasizes the role of comprehensive preparation and foresight in ensuring seamless project execution and workflow optimization. You and your team members will find that your work flows better when everything that's needed is available or in place.

A full-kit represents not just tangible resources like tools and equipment but also less tangible items like information, plans, training, permits, permissions and the availability of key personnel. The act of verifying a full-kit is a proactive measure, a mindset of thoroughness that seeks to preempt delays and inefficiencies

by ensuring all necessary components are at hand before commencing any task or project.

Real-world applications of this principle are easily found. A forester might ensure that all of the necessary contracts, notifications, permits, insurance certificates, performance bonds and access routes are in place before having a logger move on to a timber harvesting site. This logger, re-assured that all of these details are worked out, will have trucking arranged to move equipment, full fuel tanks, a well-equipped parts and tools trailer and markets lined up for all the wood that will be harvested so that logging flows well. In this way, some potential setbacks have been averted and the impact of others are minimized through preparedness.

The implications of not adhering to this rule are vividly illustrated in instructive stories that become less painful through time. It generally takes a few mishaps to fully realize what a full kit is in a given situation. Anyone who has ever failed to clear a clogged paint gun in the field knows this. Multiple trips back to town or the office can shatter a workday. Make enough of them and you will figure what is meant by having a full-kit.

The principle of verifying a full-kit underscores the universal importance of preparedness and proactive planning. The rule extends its relevance beyond professional settings into personal and everyday life activities. Whether

it's setting up machinery in a sawmill operation or preparing for a camping trip, the principle of verifying a full-kit will serve you well.

This preparatory phase is as critical as the execution itself, setting the foundation for efficient and effective project completion. Preparedness sets the tone for other team members and cooperators. As the scouts say, "*be prepared*." This approach is noticed by others and has the positive compounding effect of like-minded people seeking to work with you again in the future.

Step Back and Find Cracks

With the critical chain of dependent events in the project identified, you can then review work priorities as necessary to ensure the project flows. The formal expression of this rule is *"Triage to ensure you are working on the right priorities."* Triage comes from the medical world, where it is the process of sorting and prioritizing patients based on the severity of their condition to determine the order in which they receive medical treatment.

By focusing on the critical chain of dependent events and stages in a project where the commencement of one phase hinges on the completion of another, efficiency is maximized. If this isn't happening it is useful to take a step back from the work and measure it against the critical chain. Are the efforts being made leading to actual progress? This mindset is

useful when team members and cooperators often juggle multiple responsibilities.

The clarity in prioritizing the diverse tasks may not always be immediate. The work may be a puzzle. Careful evaluation and sometimes trial and error can show where the most critical and impactful tasks come together, guiding where efforts should be concentrated. It's possible that the original project design underestimated the importance of some roles or the difficulties in some tasks. This is especially true in projects that have new or one-of-a-kind features.

Triage involves recognizing that not every task demands immediate, detailed attention. It's about striking a balance between comprehensive planning and the flexibility to adapt as a project evolves. This dynamic approach acknowledges the fluid nature of tasks, where certain aspects become clearer or adjust as the work progresses.

Strategic use of triage involves the foresight to occasionally abandon project features (and sometimes whole projects) that, upon thorough consideration, appear unfeasible or misaligned with current priorities or capabilities. Doing this prevents the squandering of valuable resources. For example, think of instances in which weather or ground conditions made it advisable to suspend logging operations to another season or resulted in replacing one logging contractor

with another who had equipment better suited to the site.

Triage may extend beyond merely selecting tasks; it involves understanding of a project's intricacies and the interdependencies of tasks. Effective triage is underpinned by organizational skills, foresight, and the readiness to ensure that all necessary resources for the next phase of a project are readily available. It involves the professionalism necessary to recognize and correct mistakes. It may mean managing flow over feelings. It's a continuous cycle of assessment, prioritization, and execution, ensuring that efforts are directed to where they will get things done.

Manage Flow and Work Will Go

Managing project flow (as opposed to working on the project) means ensuring synchronization between steps and the availability of people and resources. It also means providing everything needed for success. The actual rule states *"ensure synchronization between your tasks, people, and resources."* It reads like a one-sentence definition of the concept of management.

If forestry is both an art and science, so is the broader concept of management. Coordination of project activities goes beyond scheduling and requires a solid understanding of the interrelationships and dependencies of tasks and how each team member and resource must

be managed to support these tasks effectively. Synchronization is not just about aligning schedules; it's about striking the right tempo for tasks, people, and resources, ensuring that each project component is aligned in timing and objectives. Personalities, budgets, equipment and other resources all factor into this.

For example, in a sawmill, maintaining a consistent flow requires continuous adjustments in priorities and resources. In these settings, synchronization is key to ensuring that the workflow remains uninterrupted and effective, avoiding inefficiencies or safety hazards. A carefully managed and sorted supply of logs, supported by working machinery and adequate staff can lead to a production process yielding a harmonious flow of lumber to fill customer orders. Mix all of these things in a disjointed way and the melody of a good day is replaced by the start-stop pattern of catastrophe. Chances are that an equal level of effort goes into both, so why not strive for harmony?

Sound management prevents the pitfalls of bad multitasking, where tasks are superficially lined up without regard for their interdependencies, potentially leading to idle time and resource wastage.

Managers must take an active role in building an environment conducive to synchronization, sometimes adopting a hands-on approach to

team dynamics and communication. This involve becoming aware that you are actually managing a project and not just working on it with others. Own and lead – there is no reward for simply being present.

Synchronization extends to the human aspect – the part of this is that is the most daunting to many of us. Comfortable vibes and synchronicity between team members boosts productivity. The absence of these things is noticeable and the challenges mount. This happens more often in projects with multiple stakeholders involved.

Coordinating activities between various parties, including people outside your organization, involves so many degrees of freedom that it is challenging. It's about ensuring not just the availability of physical tools and resources but also the smooth interaction of different stakeholders, aligning expectations, timelines, and contributions towards the collective project goals.

A workflow harmony where every component seamlessly collaborates for optimum results is a noble and elusive goal. It’s possible to achieve project goals without reaching this utopia, as long as everyone respects the efforts and contributions of others. Effective synchronization also involves balancing the needs of individual tasks (local optimums) with the overall project goals (global optimum; more

on this later). This balance is achieved through planning and agile management of resources and personnel and can seldom be achieved through hope or the “wait and see” approach. Recall Leach’s immutable law from Chapter 1 - the effort required to correct a project that is off course increases geometrically over time.

Outcome Poor? – Alter Core

If things aren’t working, consider increasing the allocation of resources and leverage, including people, attention, intensity, equipment and methods. Use a longer lever. The actual rule says, "*If you keep going back to the same projects and don’t get the desired results, look into the option to increase the dosage.*" This can be a pivotal approach to project management and problem-solving. Strategic intensification or amplification of efforts and resources is what is done when standard or repeated attempts fail to yield expected outcomes in a project. It can be a difficult concept to understand. It means more than simply trying harder.

"*Increasing the dosage*" in a project context is done in many ways. It can mean dedicating more personnel, using larger or different equipment, enhancing technological support, purchasing better software, extending time commitments, or refocusing on specific project aspects. As an example, if production on a cut-to-length logging harvest fails to exceed

operational costs, increasing the dosage might mean adding a feller-buncher to assume some of the felling and traveling burden that would otherwise fall to the harvester.

Increasing the dosage is not a one-dimensional solution of merely adding more resources. It might mean changing procedures and it could be a small change that yields the needed results. Think of a timber cruise that specified the use of a Factor 10 prism. Perhaps the work was taking too long because it was oversampling the timber relative to the goals of the cruise. Switching to a Factor 15 prism results in measuring fewer trees, speeding up the process, but also providing sufficient information for timber management decisions.

While some might interpret increasing the dosage as adding more physical resources or tools, others might see it as an increase in personal commitment, like dedicating more mental energy or creativity to the project. This rule also acknowledges the variability in its application across different scenarios and individuals. Perhaps more direct oversight is needed because a team member is inexperienced in their duties. It might also mean shifting someone's schedule and assignments in a way that allows better focus by controlling their work in progress.

A further alternative in the dosage isn't expressly stated in the rule. This is the option of

decreasing the dosage. When would this make sense? Too much of a given resource is known to produce declining returns to scale. Can a kitchen have too many cooks? Absolutely. Not only is less done but the costs are higher, and the quality suffers. This can arise when there is not a clear definition of responsibilities (each person thought the other was taking care of the task) or worse, when both people think they are in charge of something and give contradictory instructions.

Decreasing the dosage in this case means giving full responsibilities to one person and either subordinating or re-assigning the other. Once again, manage flow, not feelings (but do it tactfully!).

The rule about changing the dosage when faced with recurring challenges or stagnation in a project is a call for more intensive and strategic engagement. It's a reminder that success sometimes requires more than persistence; it's not how hard you work but where you apply the needed leverage. Whether through increasing or shifting resources, sharpening methods, or using strategies more effectively, the point is to adapt and intensify efforts to navigate through challenges and achieve the desired outcomes, ensuring that the project reaches its fullest potential.

Seek and Tweak

Repeatedly redoing work or steps you thought were complete can be avoided by identifying and fixing the causes of the failure. The formal rule says, "*Avoid unnecessary rework by finding what causes it.*" The rule stresses the importance of not just treating the symptoms or inefficiencies. It's about digging deeper to understand and rectify the underlying causes. There is much to be gained by streamlining processes and conserving valuable resources. Why should it take three attempts to get something right if you can discover the way to do it right the first time?

Rework is an all-too-common occurrence in our lives. It often signifies inefficiency and misallocation of time, resources, and effort (even as we vow to fix it next time). It arises from unclear requirements, lack of communication, insufficient planning and errors in execution. Avoiding unnecessary rework requires proactive identification and resolution of these root causes. In forestry this might mean finding the cause and fixing it because the same situation will arise again tomorrow or finding and fixing it in time for the next nearly identical project.

Can you think of a time when you noticed a relentless cycle of correcting errors without addressing the real issues? This leads to continued inefficiency and a lot of wasted effort.

Identifying and addressing the core causes of a problem might be adapting or replacing equipment, refining a production process, or improving communication and procedures. For example, if one independent team member never made it back from the field until long after dark because of a vehicle breakdown, how could this be avoided next time? It might not be possible to ensure there are no breakdowns in the future, but a procedure requiring that everyone checks in with a text message or phone call when they leave the field could save someone a long walk out.

Consistently identifying the causes of rework and implementing changes to prevent them is the direct application of Goldratt's Theory of Constraints. Interfering bottlenecks can sidetrack you from exploiting the project's true constraint – the critical chain of dependent events. Fix problems when they arise, and you can get back to making progress.

Effectively adhering to this rule involves a comprehensive approach. Be in the habit of fixing problems as soon as they are identified. Encouraging clear and consistent communication among team members is a good way to make sure everyone is aware of problems. As we learned from Leach's immutable laws in Chapter 1, address problems right away regardless of embarrassment.

Stacks not Hacks

Be prepared with tools, methods and supplies for problems that are difficult to solve without them. Systems are faster than ad hoc solutions. Goldratt's formal version of the rule states *"Standardization is recommended when improvisation is costly."* This rule succinctly captures the essence of efficient project management and workflow optimization. In some ways it is first cousin to the "Seek and Tweak" rule we discussed in the last section.

Everyone has stories of improvising to solve a problem in the field. We are rightfully proud of these stories. Our talent got us out of a jam, even if the solution took three hours to implement and cost us the rest of the workday. The next logical question to ask is "how could this have been avoided?" Have no fear, life will still provide you with plenty of opportunities to improvise.

The "stacks not hacks" principle emphasizes the importance of balancing the need for creativity and flexibility with the advantages of consistency and predictability, particularly in scenarios where the lost time needed to improvise a solution increases costs and derails project flow. While improvisation and ad-hoc solutions can sometimes offer ingenious fixes, such as using batteries to weld a suspension in an emergency on a logging site, they are not typically sustainable or safe for regular

operations. Stopping mid-chorus to restring a guitar does little for tempo.

When a project experiences inconsistent results, wastage of resources, and diminished quality because no real methods have been established, it is impossible to stay on track. First-of-a-kind projects might naturally be expected to experience this because you are making things up as you go. If this is the case, the point is to standardize by establishing and adhering to a set of defined procedures or standards, ensuring consistency and efficiency in operations.

The essence of improvement is building on the past, not re-inventing or re-discovering methods that are already established. For instance, in the franchise business model, the replicability of services and products and the customer's consistent experience hinge on the meticulous standardization of processes, making it a prime example where improvisation can be more costly than adherence to established procedures.

What does this have to do with forestry? Standardizing timber cruising methods, safety procedures and even logging close out methods save time. Time is always in demand and the essence of CCPM involves saving time on some items and tasks so it will be available for others.

Over-reliance on standardization to the extent that it stifles initiative and problem-solving skills can be counterproductive. Embracing

standardization necessitates a nuanced approach. People need to be allowed to exercise judgement in some situations. For example, we don't want individuals overly dependent on standard work instructions to hesitate to address issues that fall outside these guidelines. Communication is the key to overcoming this possibility.

Team members should recognize the standard methods of solving problems but be willing to reach out with questions when they are uncertain. Promote standardization and cultivate a culture that values initiative and adaptability. You can have both.

When standard procedures and tools are in place, it simplifies aligning efforts, collaborating effectively, and ensuring consistent quality in the output. Standardization aids in clear communication and understanding among team members. This approach also streamlines training and onboarding new team members, as there are clear and established guidelines to follow. Standardization saves time for future innovation.

Goals not Roles

Actions should serve the project goal, not individual steps or personal goals. Goldratt expresses this rule as *"Abolish local optimum; global optimum is what matters."* This rule underscores the importance of focusing on the overall success and efficiency of an entire

system or organization rather than optimizing individual components, departments, or processes in isolation. The project may rest on each task, but these tasks are not the goals of the project.

In operating a business, a public agency or an association, an emphasis on replicability, consistency, and alignment with the organization's overarching goals highlights the superiority of the global optimum. In strategy and operations, this principle is exemplified by organizations that prioritize a global perspective, aligning all efforts with their mission.

These models thrive on the predictability and efficiency brought about by standardization. Standardization must be carefully defined and subject to necessary constraints, ensuring sustainability and respect for the rights of individuals. Minimizing worker discretion is different from eliminating it.

Most of us have a natural inclination towards optimizing individual units or departments—achieving a "local optimum." Our tasks and our work are naturally important to us.

For example, a log buyer for a sawmill might naturally want to buy everything a reliable supplier produces, even though the sawmill already has sufficient log inventory for the foreseeable future. Keeping a supplier happy is a local optimum for the buyer, but the global

optimum for the sawmill involves careful management of cash flow and inventory.

The global vs. local conflict is especially true when the overriding project goals have not been properly communicated. Placing the global optimum first may involve shifting our notion of the importance of our efforts to be aligned with doing high quality work that is completed on time. The timely completion part ensures the correct recognition for the global optimum.

Placing goals before roles means always considering how actions and decisions affect the entire system. This approach ensures that individual efforts contribute positively to the whole. The rule challenges leaders and team members to prioritize the global optimum through collaboration, alignment, and thinking in an interconnected way.

The project manager or team leader has the responsibility of ensuring everyone knows and can articulate the global optimum. People cannot be faulted for failing to prioritize things don't know about. As one logger put it "*if you don't know, you don't know*." Chances are they never knew. It is your job to tell them.

Flow Freely

Following Goldratt's Rules of Flow ensures that projects progress efficiently along the critical chain. These principles, while non-sequential, collectively work to mitigate the effects of

unnecessary bottlenecks and Murphy's Law, enhancing overall project performance. By integrating these rules into project management practices, teams can maintain momentum and address challenges proactively.

The Venn diagram on the following pages categorizes the eight rules of flow into three distinct areas: task management, resource management, and system optimization. Each circle in the diagram represents one of these categories, and their intersections illustrate how combining these aspects can achieve optimal project flow.

Task management encompasses rules focused on managing the sequence and prioritization of tasks. It includes avoiding bad multitasking by controlling work in progress (WIP), ensuring all necessary resources and information are available before starting a task (verify full-kit), and prioritizing tasks effectively to address the most critical ones first (triage).

Resource management relates to the allocation and synchronization of resources. This involves ensuring synchronization between tasks, people, and resources to avoid delays and ensure a smooth workflow. It also includes increasing the effort or resources ("dosage") if the desired results are not being achieved and avoiding unnecessary rework by identifying and mitigating its causes.

System Optimization focuses on improving overall efficiency and effectiveness within the project. This includes standardizing processes when improvisation is costly and avoiding local optima by striving for global optimization, ensuring that the entire system works cohesively towards the project goals.

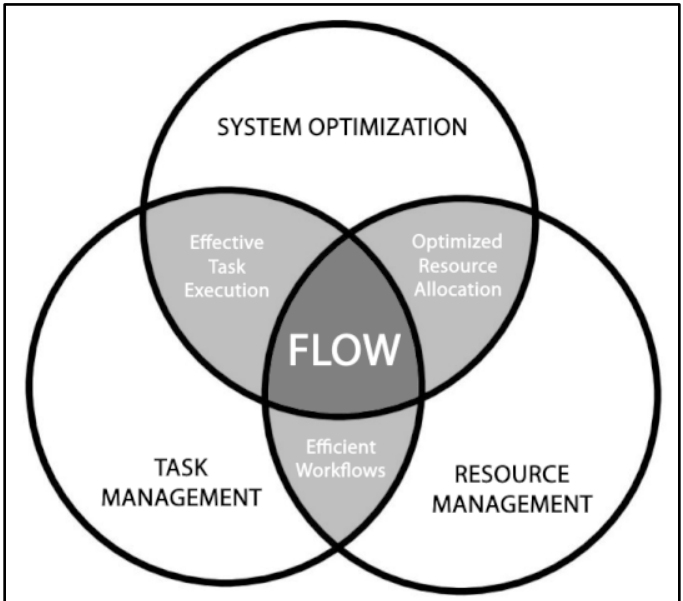
The intersection of Task Management and Resource Management results in efficient workflows, where properly managed tasks and resources ensure timely and efficient task completion. The overlap between Task Management and System Optimization leads to effective task execution, where implementing optimized systems in task management results in fewer delays and errors. When resource management intersects with system optimization, it leads to optimized resource allocation, maximizing the efficiency and effectiveness of resource use.

At the center of the Venn diagram, where all three circles intersect, is optimal project flow. This represents the seamless project execution achieved by combining effective task management, resource synchronization, and system-wide optimization.

Regular training sessions, workshops, and team discussions can help embed these principles deeply into the organizational fabric. To fully harness the potential of Goldratt's Rules of Flow, it is essential to foster and encourage a

culture of continuous learning and adaptation within the organization. This involves applying the rules and consistently reflecting on their effectiveness. It also means seeking opportunities for improvement. Leveraging technology, such as project and time management applications and data analytics, can provide valuable insights into workflow patterns and areas needing attention.

A work environment that encourages experimentation, feedback, and innovation allows organizations to remain agile and responsive to changing project dynamics. This ensures long-term success and sustainability.



Task Management:

- Avoid bad multitasking; control your work in progress (WIP).
- Verify full-kit before you get going.
- Triage to ensure you are working on the right priorities.

Resource Management:

- Ensure synchronization between your tasks, people, and resources.
- Increase the dosage if you aren't getting desired results.
- Avoid unnecessary rework by finding what causes it.

System Optimization:

- Standardization is recommended when improvising is costly.
- Abolish local optimum; global optimum is what matters.

Case Story: Colfax Timber and the Flow of Logs

Colfax Timber, a subsidiary of Huron Hills Lumber, owns 75,000 acres of timberland in support of the parent company's sawmill. The primary purpose of owning and managing this land is to supply hardwood sawlogs for the mill. Additionally, these lands produce cash flow from a number of sustainable activities. Among these are recreational leases, maple syrup production and the sale of low-grade wood products from timber stand improvements.

The company faces various challenges typical in the forest products industry, including weather unpredictability, equipment failures, a shortage of loggers and even coordination between the timberland staff and the sawmill managers.

Mack is the Chief Forester for Colfax Timber. He has close to thirty years with the company, including ten years of being in charge of the whole works. Mack is known for his strategic thinking and hands-on management style.

Trevor is the Sawmill Operations Manager at Huron Hills Lumber. He is technically Mack's equal, and they must coordinate activities.

Trevor notices that the sawmill's efficiency drops significantly when the flow of logs from the timberland is sporadic, something that has been increasingly common with the poor weather they have experienced for the last two

years. He brings this concern to Mack, and also complains to the company's owners about the inconsistent supply of logs.

Mack takes a good look at what is going on in his operation. He knows his job is to supply the mill, but there are ground level realities he must work through. His first step is to confer with his field forester, Sarah, who does most of the ground-level work on Colfax Timber's land base. He also checks in with their go-to contractor, Murray, who is a cut-to-length logger with years of experience.

After these two conversations, Mack makes some changes. Enhancing access to the timberlands becomes a priority, shifting funds in the budget from replacing a recently lost staff member to purchasing stone and reinforcing roads. He also shifts the harvesting schedule away from timber stand improvement work. There simply aren't enough loggers available to do both types of harvests.

Sarah isn't happy with the changes initially, but she grudgingly complies. In the short run this means redoing the harvesting scheduling by putting timber stand improvements on hold. She also streamlines her process for moving Murray onto new harvesting sites and starts looking for a second logging contractor.

Sarah works with Lucy, Colfax Timber's Operations Coordinator to ensure that all resources are in place when Murray arrives on a

site to begin logging. Lucy is a clerk of the works who is an expert at handling details on a wide range of fronts. With Lucy's help, Sarah can avoid delays and interruptions once harvesting on a site begins.

The flow of logs to the sawmill becomes more predictable. For a time at least, Trevor is happy and stops complaining to the owners about Mack's performance.

When a sudden windstorm blows down 2,000 acres of timber, Mack steps back to reassess priorities. Salvaging the downed hardwood timber becomes critical to prevent staining and loss of value. He conducts a triage, focusing first on areas where timber can still be salvaged and delaying less critical activities. This ensures that the most valuable timber is processed first, minimizing losses.

Trevor gets wind of this effort and wants Mack to simply write off the damaged timber and focus on the accelerated harvesting schedule. Mack and Sarah both balk at this idea and in the end the owners tell them to proceed with the salvage.

Lucy has a role in the salvage operation as well. She quickly invents and implements standardized procedures for obtaining permits and coordinating logistics. In many cases the salvage harvests are technically clear cuts, and this prescription requires a special permit. Lucy's standard procedures reduce the time

spent on these tasks and minimize errors, making sure they can switch between salvage sites quickly. By following these standardized processes, the team can focus on getting timber salvaged rather than on administrative hurdles.

Sarah coordinates closely with Murray to ensure that logging activities comply with acceptable management practices for water quality and that he is taking the necessary safety precautions in working with the downed timber. They schedule regular check-ins to synchronize their efforts, ensuring that logging does not proceed in sensitive areas without Mack's clearance. This synchronization avoids costly rework in moving equipment and ensures compliance.

For a week or two it seemed like they had to reinvent the wheel with each new section of blowdown Murray entered. Then Murray brought in his cousin from up north who had done salvage work before. After a couple of days, they produced an approach for severing and processing the downed timber.

When initial logging efforts fall behind schedule, Trevor starts complaining about the log supply again and Mack encourages Sarah to bring in a second logging contractor. Sarah knows this will not sit well with Murray and so she meets with him to go over options. In the end Murray thinks he knows a way to increase his output without bringing in another crew.

Murray will increase the dosage on his crew by hiring a tracked, swing boom feller buncher with a hot saw. This machine severs and bunches the wood before Murray processes it with his harvester and piles it for the forwarder.

This change has an almost immediate impact on production. By the second day their daily output increases by 30%. By the second week Trevor stopped grumbling, for a time.

When Trevor starts sawing the salvaged logs, he notices that many of them are damaged due to improper handling. Mack and Sarah investigate and realize the damage is from the rollers on Murray's harvester digging too deeply into the logs. Normally the tracks made on the logs by these rollers would come out in slabs when the logs were squared into cants. Instead, these marks were puncturing deeper into the quality zone of the logs and causing staining, lowering the grade of the lumber sawn from them.

It turned out that Murray had been operating with higher hydraulic pressure on the harvesting head than necessary, ever since he had done some maintenance on the machine in the spring mud season. The last job he was on before the salvage involved cutting smaller diameter beech for pulpwood. No one had cared how deep the rollers bit into sticks of pulpwood. The correction was easy enough to make once the problem was pointed out, and log quality improved from then on.

Mack emphasizes the importance of the overall goal of long term sustainability in the timber supply along with the project goal of salvaging all of the timber before it stains, over individual tasks. For instance, while it might be tempting for the logging crew to focus on easier, high-yield areas, Mack works with Sarah to make sure they focus on the stands most at risk – in this case it was those with the heaviest concentration of hard maple, which is prone to staining. While their existing timber inventory data was helpful in some cases, in others they needed field work to identify high risk areas. Sarah had to stay ahead of Murray's logging crew to figure out where to put them next. Site moves took place nearly every week.

They were able to continue the salvage work through the winter, in part because they got below average snow cover, but then a particularly wet and prolonged spring brought new challenges. Persistent rainfall left ground conditions so wet that logging is curtailed for much of the time.

Mack and Sarah realize that pushing forward in these conditions would damage the forest floor and compromise their sustainability goals. They decided to postpone operations in the affected areas, prioritizing long-term forest health over immediate sawlog supply.

Back at the sawmill, Trevor becomes increasingly concerned as sawlog inventory

dwindles. He pressures Mack to expedite logging operations, suggesting that they prioritize areas that are still accessible, even if it means deviating from the sustainable management plan. Trevor's immediate concern is meeting customer demand and maintaining the sawmill's operational efficiency.

Mack finds himself in a difficult position, needing to balance Trevor's demands with the sustainability commitments of Colfax Timber. He convenes a meeting with everyone involved to discuss the situation. Mack explains the long-term consequences of compromising on their practices and presents a revised plan that balances the mill's needs with sound field considerations. Mack holds firm on his commitment to sustainability and offers to loan Trevor some of his two forest technicians to purchase logs on the open market.

After extensive discussions and a direct intervention by the ownership group, a compromise is reached. Trevor is skeptical of Mack's plan to purchase outside logs for the mill but has no choice but to agree. Mack already has Lucy making inquiries and she has lined up a couple of potential suppliers who are working on sandy ground in an area south of their region. The logs will cost more than usual but this is better than idling the sawmill.

Mack also proposes that they increase logging efforts in less sensitive areas that are still

accessible while implementing stricter monitoring to ensure minimal impact, even if it means they can only work 2 or 3 days a week. Murray happily agrees – some work is better than no work, as far as he is concerned. He also agrees to work on weekends if that is when conditions are dry enough to proceed.

The team implements the revised plan with careful monitoring. Sarah conducts frequent site visits, and they all check the weather forecast on their phones several times a day.

This additional effort starts to pay off. The mill goes from having a two-day supply of logs in the yard to a week's supply and then, by the end of the Spring, a three-week supply. All they need is another month of typical summer weather to finish the salvage work and resume the previous harvesting schedule.

Through the strategic application of the rules of flow and effective communication and coordination, Mack successfully navigates the friction between immediate operational demands and long-term sustainability goals. The log inventory squeeze concludes with a balanced approach that sustains both the health of the forest and the operational needs of the sawmill, demonstrating the effectiveness of these principles in a real-world situation.

Summary of Colfax Timber's use of the Rules of Flow

Mack and his team at Colfax Timber implemented Goldratt's Rules of Flow effectively to address challenges and improve operational efficiency. Here's how they applied these principles:

1. Avoid Bad Multitasking; Control Your Work in Progress (WIP)

- Mack shifted the harvesting schedule to focus solely on supplying the mill, reducing multitasking that caused inefficiencies. This decision helped streamline efforts and prioritize critical tasks, ensuring better flow and resource allocation. Mack knows that muti-tasking holds others back.

2. Verify Full-Kit Before You Get Going

- Sarah coordinated with Lucy to ensure all resources were in place before moving Murray's equipment to new sites. This preparation prevented delays and interruptions, maintaining steady workflow and efficiency. Their mantra is "*kit ready, work steady.*"

3. Triage to Ensure You Are Working on the Right Priorities

- Mack triages on more than one occasion. The first is when he takes a step back to

find the cracks in the original harvesting schedule. Next, when a storm blew down 2,000 acres of forest, Mack prioritized salvaging the most valuable timber first. This triage ensured they focused on high-priority tasks, minimizing losses and maintaining operational focus.

4. Ensure Synchronization Between Your Tasks, People, and Resources

- Sarah and Murray know that if they manage the flow the work will go as planned. They scheduled regular check-ins and coordinated closely to ensure compliance with management practices and safety precautions. This synchronization ensured efficient operations.

5. Increase the Dosage if You Aren't Getting Desired Results

- When logging efforts lagged, the team knew they would have to alter the core approach to harvesting and worked with Murray to do this. Murray increased his crew's output by hiring a tracked, swing boom feller buncher. This adjustment led to a significant boost in daily production, demonstrating the effectiveness of increasing resources when needed.

6. Avoid Unnecessary Rework by Finding What Causes It

- When Mack and Sarah were confronted with the damage to the salvaged logs, they knew they would have to seek the cause and tweak the way things were done. They identified the root cause of the log damage: Murray's harvester's high hydraulic pressure. Correcting this issue prevented further quality issues, aligning with the principle of addressing core problems to avoid rework.

7. Standardization is Recommended When Improvising is Costly

- Lucy firmly believes that stacks of wood are better than hacks. She implemented standardized procedures for obtaining permits and coordinating logistics during the salvage operation. This standardization reduced administrative hurdles and allowed the team to focus on their primary tasks.

8. Abolish Local Optimum; Global Optimum is What Matters

- Mack's cultivation of teamwork places project goals ahead of individual roles and sustainability ahead of short-term gains. He maintained a balance between Trevor's demands for sawlog supply and the long-term sustainability goals of

Colfax Timber. By holding firm on sustainable practices and proposing the purchase of outside logs, Mack ensured decisions served the overall project goals rather than individual preferences.

Through strategic application of Goldratt's Rules of Flow, Mack and his team successfully navigated operational challenges at Colfax Timber. They avoided bad multitasking, ensured preparedness, prioritized critical tasks, synchronized efforts, increased resources as needed, addressed root causes of inefficiencies, standardized procedures, and focused on overall project goals. These actions improved the flow of logs to the sawmill and balanced immediate demands with long-term sustainability, demonstrating the effectiveness of these principles in enhancing project management and operational efficiency.

Abbreviated Rules of Flow

1. Multi-Tasks Hold Others Back
2. Kit Ready, Work Steady
3. Step Back and Find Cracks
4. Manage Flow, Work Will Go
5. Outcome Poor? – Alter Core
6. Seek and Tweak
7. Stacks, Not Hacks
8. Goals, Not Roles

"After two months he realized one of the older foresters, Jamison, wasn't on board with the new way of doing things."

Chapter 6. Shifting Culture and Improving Flow

One paradox of human nature is that the strong desire to continually improve is often coupled with an ingrained resistance to change. Adopting Critical Chain Project Management requires tempo-altering changes in resource management and task prioritization. Such changes often encounter resistance because people prefer their old ways of doing things. To facilitate this transition, the organization must communicate a clear vision that highlights the benefits of CCPM, such as increased efficiency and reduced project timelines. People need to see reasons why they should change how they do things.

Resistance often arises because CCPM necessitates a shift away from established practices like multitasking, a focus on task durations instead of resource constraints, and the common padding of time estimates for safety (Scherer, 2011).

People may resist CCPM because it introduces new methods and requires changes in daily

work processes. This type of resistance is often due to comfort with the familiar and a reluctance to learn new systems or methodologies (Scherer, 2011). Since CCPM's structured approach might be perceived as reducing individual autonomy by strictly defining resource availability and task durations, employees might feel a loss of control over their own work processes.

There can be significant skepticism regarding the effectiveness of CCPM, especially if the outcomes of its implementation are not immediately visible or if it disrupts well-established processes and comfort zones (Eby, 2022). To effectively implement CCPM and overcome resistance, organizations can employ several strategies.

Team members must be equipped with the necessary skills and incentives to change the way they work. This may require training programs that emphasize the principles and techniques of CCPM. There is no reason this cannot be a quick process. The concepts are easy to explains and most organizations have new projects starting regularly where they can be applied.

The organization must change as well to eliminate disincentives for shortening task delivery windows. Accomplishing this will lead to people who are willing to deliver early when

possible and comfortable in knowing they won't be penalized for an occasional late finish.

Without these components, the organization risks encountering confusion, anxiety, resistance, frustration, or a false start, all of which can impede the successful adoption of CCPM and the realization of its potential benefits.

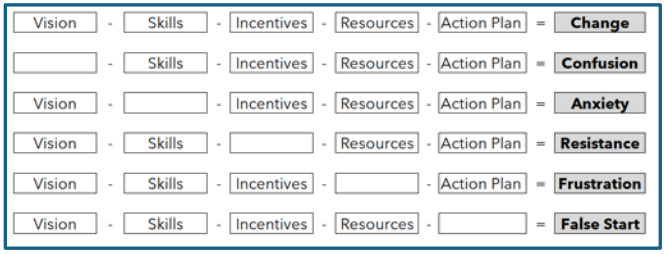
Some believe implementing CCPM can be less daunting if started with pilot projects – by dipping a toe in instead of doing a full immersion. This allows the organization to witness the benefits of CCPM without committing to a full-scale implementation immediately (Hoban, 2023).

Elder (2013) disagrees with the toe dipping approach. He argues that CCPM can be implemented swiftly and therefore shouldn't be done in a pilot project because there is a tendency of people to wait it out and go back to their old methods. Many forestry and logging operations work at a scale where a single project may be their main focus at any one time. This is then an advantage in making the switch to CCPM wholesale and continuing with it moving forward.

Successful Organizational Change

Dr. Mary Lippitt's and others produced what came to be known as the Lippitt-Knoster Model for Managing Complex Change. This model,

reduced to the Complex Change Diagram on the next page, highlights essential components required for effective organizational change: vision, skills, incentives, resources, and an action plan. The absence of any of these elements can lead to specific negative outcomes.



Lippitt's (1987) Complex Change Diagram

Vision provides direction and goals for everyone involved. Without a clear vision, people are left without an understanding of where they are headed, resulting in confusion and misaligned efforts. Vision ensures that all efforts are aimed at a common objective. A clear vision of a project using CCPM is that it is one that finishes on time or even early.

Skills represent the abilities and knowledge required to achieve the vision. When individuals possess the necessary skills, they feel competent and capable of contributing to the change process. Conversely, if skills are lacking, anxiety ensues. People may feel unprepared and doubt

their ability to implement the changes effectively. Team members need to feel comfortable identifying situations in which they or the organization lack the skills to do the work.

Incentives motivate people to support or engage in the change process. Without incentives, individuals may resist change as they do not see personal or professional benefits, leading to significant barriers to successful change. These incentives can be tangible, such as rewards and recognition, or intangible, such as personal growth and job satisfaction. In switching to CCPM, project leaders need to be careful not to penalize team members for finishing tasks early by saddling them with extra work.

Resources are the tools, time, and materials needed to implement the change. When resources are available, people can carry out their tasks efficiently and effectively. The absence of resources leads to frustration, as people may feel hindered and unable to perform their roles adequately. Leaders make sure these resources are available. Goldratt's Rules of Flow promote this idea as well.

An action plan outlines the steps required to achieve the vision. Without an action plan, there can be a false start where efforts begin but quickly falter due to a lack of direction and coordination. This plan provides a clear roadmap, ensuring that everyone knows what needs to be done and when. Identification and

communication of a project's critical chain and clear task instructions and timelines are the action plan in this case.

Successful organizational change hinges on having a clear vision, skilled individuals, motivating incentives, adequate resources, and a well-defined action plan. This is as true of adopting CCPM as any other major change. The absence of any of these elements can lead to confusion, anxiety, resistance, frustration, or a false start, thereby hindering the change process.

Implementing CCPM Methods

Comprehensive training helps demystify the process and demonstrates how CCPM can lead to more efficient project completion. Educating a team involves both the *how* and the *why* behind CCPM, facilitating a smoother transition to this new way of working (Layoyan, 2023).

For CCPM adoption to be successful, strong support from top management is essential. Leaders must advocate for the change and model the behaviors they expect to see from their teams (Goldratt-Ashlag, 2023).

Identifying and empowering internal CCPM champions can help facilitate change by providing peers with a go-to resource for help and guidance. These champions can drive the CCPM processes forward by motivating others

and providing support during the transition period (Goldratt, 1984).

Maintaining regular updates and transparent communication about the CCPM implementation process and its outcomes can help build trust and buy-in at all organizational levels (Scherer, 2011).

Being responsive to feedback and willing to adjust the CCPM approach as necessary can help mitigate resistance and increase the method's acceptance. This adaptability shows that the organization values employee input and is committed to finding a balance that works for everyone (Jarvis, 2019).

The Critical Chain Mindset

If you have reached this point in the book, the concepts of Critical Chain Project Management probably resonate with you. Perhaps you are still uncertain about implementing CCPM if you lack formal authority or do not manage a team directly.

While it may be easy to feel detached from CCPM and to identify reasons why it may not be applicable to you, this is not necessarily the case. It's easy to find reasons why changing won't work for you once you start looking. Focus instead on the many benefits of better project flow and improving your work performance and you will know the time has come for this shift.

One feasible strategy is to incorporate a CCPM mindset into your daily routine. Even without the power to delegate tasks, you can still exert influence and persuade others to collaborate and advance projects along the critical chain by leveraging your influence and employing negotiation skills.

You are likely involved in a project where others depend on your output, and you, on theirs. This provides a foundation for negotiation. Influence can arise from previous interactions, such as fulfilling promises and delivering on time, building trust and reliability.

Being persuasive and dependable increases the likelihood that others will prioritize your tasks. To enhance interactions, strategically request assistance. If someone agrees to help, consider asking them to begin a day earlier than necessary; this creates a buffer and boosts the chances of receiving their input sooner, thereby benefiting your schedule.

In environments where people regularly juggle multiple projects, it is crucial to identify and focus on critical chain activities. For many people, mornings are the most productive time of their day. Dedicate your best hours to critical tasks to make progress efficiently and reward yourself later by working on less urgent tasks, provided they do not cause delays.

Planning your day—or even your week—around critical chain activities ensures that you allocate

most of your time to these essential tasks, establishing a productive tempo and rhythm.

Adopting a CCPM mindset can enhance your reputation as a valuable and dependable team member. This approach helps ensure that you are recognized as someone who consistently delivers and completes tasks effectively. This is vital for career progression. If you find that others are consistently exploiting your efforts without providing appropriate recognition or advancement, it may be time to explore new opportunities where your skills and contributions are more valued.

Improving your output enhances your value. Accountability is in short supply and others will notice your performance. Be prepared to take advantage of opportunities with new organizations, partners and clients who appreciate what you bring to work situations.

Understanding and applying CCPM principles can change your perspective on project bottlenecks and efficiency, making you a proactive and strategic team member. In this way you can simultaneously advance both yourself and the goals of your organization.

The shift to CCPM requires consideration of the organizational culture and readiness for change. Effective change of management practices, supported by clear communication and education, can facilitate this transition and help overcome the natural resistance to new ways of

working. By addressing these elements, organizations can maximize the likelihood of successful CCPM implementation and the associated benefits in project management efficiency and effectiveness. The following story brings this process to life.

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Case Story: Davis Makes Critical Changes to the Culture

It seemed like Davis had been waiting for this opportunity ever since he graduated from Michigan Tech 20 years earlier. He had been a bit of a nomad in his forestry career with stops in the Northeast and the South and he always wanted to get back to the Lake States. He earned his new opportunity after ten years with Saint Paul Timberlands by doing a three-year stint in Mississippi.

While Mississippi is a great forestry state, the Lake States were home for him, and he promised his wife they would return there after three years, even if it meant finding a new job. Fortunately, he didn't have to. Saint Paul Timber, a TIMO with large land holdings in multiple regions, had just made a major acquisition in Wisconsin and Michigan. Saint Paul Timber, or SPT was affectionately, most of the time, referred to as "spit" in the forestry world. It had been around for close to 30 years

but had really grown by leaps and bounds over the last decade, corresponding with Davis's time at the company.

Some of the upper management team had doubted Davis and were unsure if he should be given the lead in managing the new acquisition. They favored a candidate from the home office they had worked with on a daily basis. Davis made it clear he would leave if he was not offered the job. He knew they had a sunken cost mindset and so all the training they had given him over the years gave him a bit of leverage with the company and he didn't hesitate to use it.

Saint Paul Timberlands bought all the timber holdings of Jericho Forest Products, one of the last vertically integrated companies in the region. Jericho had 132,000 acres of timberland, a hardwood sawmill, a white pine sawmill, and a pulpwood yard with a chipping plant. The mills had been sold to a venture capital firm that retained a five-year supply contract on the land. The Jericho lands addition to Saint Paul Timberlands holdings would now be known as "Copper Falls SPT."

The new work with Saint Paul Timberlands would be different for the old Jericho Forest Products staff. In the past they were managing timberlands to support a mill and, as near as Davis could tell, were operating by the seat of their pants. SPT had different standards from

Jericho and from many other forestry outfits. Upper management had decided to keep as many of the Jericho forestry staff as wanted to stay, figuring they would weed themselves out over time. Meanwhile SPT would glean as much knowledge about the land base as they could while the Jericho staff remained with the company.

When the sale closed, Davis inherited a four-person forestry staff from Jericho Forest Products. This was one more forester than he needed, according to the head office in Minnesota. Davis had seen this movie before and was confident they would be down to four foresters in time.

In addition to managing the land, the Copper Falls SPT group was intended to be a rapid assessment team looking at other potential acquisitions throughout the Lake States, Pennsylvania, and even into Virginia. With this in mind, he needed to get the team on board with the new way of doing things, managing their lands to serve the needs of the investors instead of a mill. Time spent on the timberland was meant to serve the investors, and the time allocated towards acquisitions was meant to serve the parent TIMO and other potential investors.

Fortunately for Davis, the whole transaction was complicated and took a long time to close. This gave Davis five months to move into the region,

become more familiar with the land base and markets, and get his family settled before routine operations began. When the sale closed, he hit the ground running.

Davis managed to purchase a large pole barn maintenance shop with integrated offices that used to belong to a construction company. It wasn't far from Jericho's chipping plant, and it adjoined one of the company's smaller tracts of land. This would serve as the team's headquarters. Davis intended to allow a hybrid work from home schedule, mostly to accommodate the team members who lived closest to the lands they managed. Each of the foresters kept their trucks at their homes. This aspect of their work routines, at least, would remain unchanged.

Davis was expected to accomplish the following things in his first year managing Copper Falls SPT:

- Produce turnkey level efficiencies in routine forestry work, including writing management plans, enacting prescriptions consistent with SPT's goals and sustainability constraints and managing timber sales in a way that met their supply contract obligations;
- Begin updating all forest and stand-level data to SPT's cloud-based transparency standards for shareholders; and

- Develop a rapid assessment team that could be deployed to potential land acquisitions on relatively short notice.

Apart from these objectives, Davis knew he needed to create a work culture that allowed him to succeed. He doubted the people at the SPT head office knew how important this was – they just expected him to get on with the work. He had been part of work situations that could have been much better if only the right leadership was in place and Davis was determined that things would go well now that he was in charge. He knew it was foolish to think people would change the way they do things just because they were told to do it.

Any SPT shareholder had access to their operations website and could click on any location on the property to find out the inventory, potential prescriptions, and harvest scheduling plans. This allowed the firm to take advantage of market opportunities and work with the ever-changing seasons. It also meant that people could look over their shoulders in a way that made many foresters uncomfortable.

Shortly after they were all moved into the new office, Davis posted a press release about his new team on LinkedIn, tagging the profiles of each of the team members. He also shared the release with each of the staff in case they wanted to post it anywhere. Davis wanted everyone to know about them.

Two weeks into his time with the new team, Davis gave all of the staff Friday afternoon off and invited them to bring their families to his home for a cookout. He wanted to get to know them better and for them to see he was making a long-term commitment to live and work here. He also knew that meeting his wife and two children made a lot of people more comfortable with him.

In this setting he learned things about the rest of the staff that would have taken him months to uncover otherwise.

Jamison was the oldest of the group, with grown children. He had started working for Jericho right out of college, left once to work somewhere else and later came back.

Davis asked Linn about the unusual spelling of her name and learned that her father had insisted on naming her after the Linn tractors that were used to move logs in an earlier era. *"I was born to be in this industry*," she told him.

Luke had moved to Wisconsin from Maine, following a girlfriend who was now long gone. "*All's well that ends well*" he told him. He met his wife sometime later and now never wanted to leave Wisconsin.

Brent was the youngest of the group and unmarried. He seemed uncomfortable in this family setting and looked relieved when Davis's

wife put him to work helping out. Soon he was chatting away with the kids.

One of the casualties of the sale of Jericho Forest Products was Carol, a long-time office manager at the chipping yard. She was competent and well-liked, and Davis personally did a background check and hired her to be the office manager. An experienced office manager was crucial in unifying the team and staying on top of details. Despite Davis telling them all not to bring anything to the cookout she brought a large basket of oatmeal raisin cookies that everyone loved.

The other guest was Rose, a brand-new hire. Davis had wanted to bring in a GIS and technical support person who could also cruise timber at times. At least half of the original staff had no GIS experience, and he didn't want them to spend a lot of time learning things that could be handled separately through a support person.

He was fortunate enough to hire Rose, who had been his sister's babysitter 10 years ago. His sister was known to be difficult, so anyone who got her endorsement must be something special. Years ago, at his sister's urging, Davis had coached Rose a bit about choosing a college with a good forestry program. He recognized her name when it came up in the applicant pool and jumped at the chance to hire anyone his sister thought was accountable. Accountability was number one on Davis's hiring list. The bonus

was that she was a darn good GIS person and seemed eager to learn field operations.

Everyone was a bit more comfortable with their new work situation after this cookout and Davis wanted to move quickly to build on this. He spent the next week devoting an individual day to working in the field with each of the foresters. He told them more about the company and his background.

Davis also used this window of opportunity after spending time with each of them to institute a new safety procedure in which they each checked in at the end of the day, so he knew they left the field safely. He thought it might seem too overbearing to have them report this directly to him and instead worked out a system where they sent a text message to Carol, the office manager. Everyone liked Carol and she enjoyed having this responsibility.

Davis's boss was Sedgwick, the vice president of forest operations who worked in the head office in Minnesota. Davis asked him to participate in their weekly meeting remotely so that the staff would realize they were an important part of the larger company. After Davis had completed his individual days accompanying each forester, he arranged for Sedgewick to spend a week at their office. Sedgewick then put in a day with each forester individually. He knew Sedgewick would bend their ear about his vision for the company and it would echo everything Davis

had been telling them. It was important they learn that they were part of something new and hopefully exciting.

The vision for the new Copper Falls SPT was straightforward. They had a five-year charge to bring all the forest management plans for 23 blocks of land up to company standards. A handful of tracts had no plan whatsoever. Writing these plans would serve as the training ground for the new way of doing things.

The main office in Minnesota would support Davis's team in this work. In addition to GIS and related support from Rose in their office, they had technical resources available to them from the head office in Minnesota. This support came in the form of a guy named Larmer, the chief mensurationist for Saint Paul Timberlands.

Larmer designed all their timber cruises to meet necessary specifications. He liked to have all of the required information, but no more than that. This was a time saver. Davis had found that a lot of the forest sampling that was done was out of habit or conventions that had been followed for so long that they went unquestioned. Larmer had taught him to question each situation and find the right way of doing things.

Davis had developed a good relationship with Larmer, who was technically brilliant but socially awkward. Davis took the time to get to

know him and develop a friendship, which proved beneficial whenever Davis needed something from him. Larmer was definitely "on the spectrum" as they say, and his blunt manner was both intimidating and off putting to some of the people in the company. Davis had always thought that if you found out what interested people and listened when they talked about it, you could get along fine with them.

After a month or so of judging the tempo of the current work practices, Davis was ready to make more formal improvements. When it came to dividing up the workload, Davis favored assigning people to certain tracts of land as the primary forester. The primary forester on any tract could ask for assistance from the others when needed and could always rely on Rose and Larmer for support services. Davis allowed the foresters to submit one tract of land as their absolute anchor and was relieved there were no conflicts. On closer examination he realized these tracts mostly corresponded with where the foresters lived and were the obvious choices in each case.

This left 19 tracts to be divided up, and he established a draft in which the foresters took turns selecting tracts based on seniority, with the most experienced choosing first in each round. Davis told them that they all had the same amount of seniority with the new company, so seniority for the purposes of the

draft was based on their years of experience as foresters.

After the draft, which was done anonymously through a web survey Davis set up, they held an in-person meeting to hash out the selections and make any necessary swaps. The acreage of the tracts varied wildly so a long group discussion was necessary to lend a greater sense of balance to the actual acreage managed by each.

Once the foresters realized the online draft survey allowed them to pass, the end result was three parcels that no one wanted. Davis took responsibility for three tracts himself, showing he was willing to do the work alongside his team.

Next Davis implemented new procedures for writing management plans and preparing timber sales, involving several steps and interactions with other staff members, including Rose, Larmer and even Carol.

When Rose was hired Davis enrolled her in a Vermont Forest Business School short course on critical chain project management, so she was the most prepared for the new procedures. He had been lucky to get her into the program, but a consulting forester friend from Northern Wisconsin was an alumnus of the program and put in a good word for her as a favor to Davis.

Both the standards and timelines for management plans and timber sales were

completely new to the staff. The allowable cut guidelines were provided by Larmer and tailored to meet the desirable prescriptions and supply contract requirements in consultation with Davis. Foresters used this information to move forward with harvesting plans that they submitted to Davis for approval. Those foresters who were more heavily involved in writing management plans would provide support to their peers who had more timber sales to design and oversee.

After two months, he realized that Jamison, the oldest forester, wasn't on board with the new way of doing things. Davis spent a day in the field with him going over things the first time this happened, but Jamison kept reverting to his old ways. The second time it happened, Davis knew he had to act. With the support of the main office, he let Jamison go on a Monday morning with the promise of a good recommendation based on his past work history.

This wasn't a fun conversation, but Jamison took it as well as could be expected. He was a professional and SPT gave him a respectable severance. Davis called a full staff meeting for later that day and explained the situation to the team. He would assume Jamison's responsibilities himself for the time being and reassign these duties in the coming months.

One of the most significant changes to the way most of the staff worked in the past was SPT's

profit sharing plan. Profit sharing involved overcoming dual hurdles – the staff must meet their clearly stated annual objectives and Copper Falls SPT must show a profit. If they did this, each of them would receive a significant bonus, even Carol. All profit-sharing bonuses were equal. In the past, they got occasional bonuses from Jericho, with no clearly defined criteria and there were whispers that the bosses played favorites. Carol had never been given a cash bonus in any job before, though Jericho gave her a turkey every Thanksgiving.

Rose was working out quite well in her job and Davis started to lean on her a bit more. He had her spend a day or so each week in the field with one of the foresters. This allowed her to learn more and made the foresters more likely to come to her with problems she could solve for them.

Davis also had Larmer come to work in their office from time to time. He thought the others would get to know him better in person. The upshot of this was that Larmer started to give the team the same level of responsiveness he gave Davis. Larmer was an important resource in many of their projects and was a direct part of the critical chain in others, so this relationship was a key part of their work.

The team slowly came together, despite the challenges of the supply contracts and market demands. Davis negotiated with the hardwood

mill to ensure prices were based on current market values, consulting with his forestry staff frequently. He viewed his job as mostly facilitating the team's work and encouraged them to be comfortable in asking him for time, equipment or training opportunities. They didn't always get exactly what they wanted but they came to know it was ok to ask.

After Copper Falls SPT's first year of existence Davis's group grew to be more than the sum of its parts. Instead of being Jericho's cast offs, they were a team. Following the action plan that Davis had laid out for them, they navigated their way through a year of timber sales, management plan updates and a pair of rapid resource assessment projects in other states. They were pleasantly surprised at the size of their profit-sharing bonuses. There was also a lot less talk of the old days at Jericho and some former Jericho employees had started sending Davis resumes.

Summary of How Davis Changes the Culture:

Davis effectively implemented several strategies to instigate and nurture a culture change within the new Copper Falls SPT team. His method was to follow Lippitt's approach to change in order to get the group to successfully adopt Critical Chain Project Management (CCPM). Here are some examples of how this was done:

1. Clear Vision and Communication

- Davis communicated the new objectives and the vision for Copper Falls SPT clearly, ensuring everyone understood the shift from the mill-centric supply approach to investor-focused land management. This aligns with the need for a clear vision in Lippitt's model.

2. Building Relationships and Trust

- Hosting a cookout for staff and their families helped Davis build personal relationships and trust with his team. This fostered a supportive work environment and helped demonstrate his commitment to their long-term success.

3. Empowering and Involving Staff

- Davis involved the team in decisions like the selection of land tracts through a draft system, empowering them and ensuring their buy-in. This participative approach helped reduce resistance to change.

4. Support and Training

- By sending Rose to a VT Forest Business School critical chain project management course, Davis ensured that his team had the necessary skills and support to adopt the new procedures.

5. Creating a Supportive Environment

- Instituting a safety check-in procedure via Carol, the well-liked office manager, provided a non-intrusive way to ensure everyone's well-being, creating a supportive work environment.

6. Effective Use of Resources

- Davis utilized Larmer's expertise in timber cruise design and data management, showing how leveraging internal resources can drive efficiency and adherence to new standards.

7. Regular Updates and Inclusion

- Davis maintained regular updates and included his team in weekly meetings with the vice president, ensuring transparent communication and reinforcing their importance within the larger organization. He also showed he was one of the team members by taking over management of the tracts of timberland no one else wanted.

8. Handling Resistance

- When Jamison repeatedly resisted the new procedures, Davis addressed the issue decisively yet respectfully, demonstrating the need for alignment with new organizational goals while providing support for transitions.

9. Incentives for Change

- Implementing a profit-sharing plan tied to clear objectives and overall company profitability motivated the team to embrace the new way of working, aligning individual and organizational goals. Firing Jamison also demonstrated negative consequences for people who did not adopt the new approach to the work.

Davis effectively used a combination of clear communication, leadership, relationship-building, empowerment, training, supportive practices, and incentives to drive culture change among the new Copper Falls SPT staff. His approach ensured alignment with the new organizational vision and facilitated a smooth transition to new management practices. By addressing resistance and maintaining transparent communication, Davis created a cohesive and motivated team that was well-prepared to meet new challenges and objectives.

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Change is inevitable, so why not change in ways that improve your work life? CCPM is a proven way to improve project results. Learning the principles is easy, but getting the necessary buy in from team members and entrenched organizations requires effort. What's stopping

you from getting the results that your efforts deserve?

Remember Cliff at Skanawan Lumber? Read on to see how he moved on from his failed procurement improvement project.

Finale: Skanawan Lumber's Next Chapter

After the procurement project at Skanawan Lumber, Cliff reflected deeply on the lessons learned and the paths to improvement. The experience, though frustrating, provided a clearer understanding of the company's internal dynamics and the challenges of managing multiple sawmills. He realized the critical need for teamwork and that he needed to be a better leader.

A specific incident that remained with him was the heated argument between Bill and Logan over log inventory that had initially spurred his decision to analyze their procurement methods. This confrontation underscored the need for change and better teamwork and started him down the road of finding how to make it happen.

Another pivotal aspect of Cliff's personal growth was dealing with Ray, the Head of Procurement. Cliff had trusted Ray enough to put him in charge of procurement at all the mills but not enough to lead the procurement assessment. As a result, Ray went from being a mediocre performer to a hindrance. Ray's resistance to change and his failure to implement effective procurement strategies highlighted the need for a more hands-on approach from Cliff, as well as his need to be a better manager of his key people.

Realizing the complexity of managing people and resources across different mills, Cliff acknowledged that his initial complacency had allowed problems to fester. His enrollment in the Vermont Forest Business School's six-month *Essentials* program was a turning point, providing him with new insights and tools, particularly in Critical Chain Project Management. The program offered theoretical knowledge and practical strategies that directly addressed the issues he faced at Skanawan Lumber.

Armed with this information, he decided to tackle the procurement improvement project again. He was hopeful this process would also reveal an internal candidate for the Head of Procurement position that had been vacant since Ray's retirement.

Steps Towards Improvement

1. **Identifying the Critical Chain**: Cliff began by clearly defining the scope and objectives of his new project—to streamline the procurement process and ensure a steady supply of high-quality logs. He recognized that tasks such as data collection, analysis of procurement methods, and field assessments were crucial.
2. **Optimizing the Critical Chain**: Applying CCPM principles, Cliff focused on reducing padded time in task durations. He set realistic yet ambitious

timelines, knowing that aggregated buffers would handle uncertainties. The staff quickly caught on to the sense of urgency and importance the project had this time around.

3. **Subordinating Everything to the Critical Chain**: Cliff ensured all tasks and resources were aligned with the critical chain. He communicated the importance of timely task completion and avoided multitasking by assigning specific roles. This helped in maintaining a focused and efficient workflow.
4. **Implementing Buffers:** Cliff used buffers strategically to protect the project timeline. He placed project buffers at the end of the critical chain and feeding buffers before tasks that fed into it. Regular progress reviews and adjustments kept the project on track.
5. **Continuous Monitoring and Improvement**: Regular check-ins and progress reviews allowed Cliff to address emerging issues quickly. His proactive approach in reallocating resources and ensuring that critical tasks remained unimpeded led to the timely completion of the project phases.

Learning from Past Mistakes

Reflecting on the previous project's failures, Cliff implemented several key changes:

- **Improved Communication**: Cliff facilitated better communication between mill managers and procurement staff, reducing misunderstandings and fostering a collaborative environment.
- **Training and Support**: Cliff provided training sessions on CCPM principles for his team, ensuring everyone understood the new approach and their roles within it.
- **Incentives for Timely Completion**: He introduced incentives for meeting deadlines and maintaining high-quality standards, such as Friday afternoons off, motivating his team to adhere to the project schedule.

Outcome

By applying the CCPM principles learned in his Vermont Forest Business School enrollment, Cliff saw significant improvements in the procurement process at Skanawan Lumber. The project, though initially met with resistance, ultimately fostered better cooperation and a more streamlined workflow. The procurement staff felt more supported, leading to enhanced performance and profitability.

Implementation of the improved procurement procedures, along with a process for on-going improvement in this area became the focal point of interviews with candidates to become the new Head of Procurement. Two strong internal candidates for this job had emerged over the

course of the improvement project. Cliff would have trouble deciding between the two, but he had decided whichever one did not get the job would be getting a raise and elevated job title as well.

Cliff felt himself transform from a reactive manager to a proactive leader during this project. The lessons from his grandfather's unyielding thoroughness and his own experiences culminated in a reinvigorated approach to managing the company. This experience not only benefited Skanawan Lumber in the short run but also gave Cliff the confidence and background he needed for future companywide improvement projects. He smiled to himself as it dawned on him that his grandfather would approve of the work he was doing.

CCPM Concise Implementation Guide

1. Identify Project Activities
2. Estimate Task Durations
3. Identify the Critical Chain
4. Add Buffers (Project, Feeding & Resource)
5. Allocate Resources to Tasks
6. Prioritize to Focus on Execution
7. Monitor and Adjust
8. Continuous Triage and Prioritization
9. Standardize Processes
10. Iterate Improvements in Each New Project

Glossary of Terms

Activity: A distinct, scheduled portion of work performed during the course of a project.

Bad Multitasking: The practice of switching between tasks that are not critical to the main chain of events in a project, when others are waiting for results, leading to inefficiencies and delays.

Buffer: A reserve of time, resources, or other elements added to a project schedule to absorb uncertainties and variabilities in task durations.

Buffer Management: The process of coordinating reserves of time and resources to protect the project's critical chain and ensure timely completion.

Case Story: A fictional in-depth examination of a particular project or scenario used to illustrate key concepts and practical applications (A case story can be considered a made-up case study).

Constraint: A limitation or restriction that affects the performance of a project. In CCPM, this typically refers to the critical chain.

Critical Chain: The longest sequence of dependent tasks that determines the overall project duration, incorporating both task dependencies and resource constraints.

Critical Chain Project Management (CCPM): A project management methodology

based on the Theory of Constraints, focusing on the critical chain of dependent events to optimize project performance.

Dependency: A relationship between tasks in which one task must be completed before another can begin.

Elder's Diseases of Project Management: A set of common project management pitfalls identified by Allan Elder, including bad multitasking, student syndrome, Parkinson's Law, task dependency, and project management math.

Feeding Buffer: A time buffer placed before tasks that feed into the critical chain to protect against delays in preceding tasks.

Goldratt's Rules of Flow: Principles introduced by Eliyahu M. Goldratt to enhance the flow of work in projects and organizations and highlighted in the book of the same name by Elfrat-Goldratt-Ashlag.

Handoff: The transition of responsibility for a task or deliverable from one team member to another.

Identify the Constraint: The first step in Goldratt's Five Step Continuous Improvement Process, involving the identification of the critical chain in a project.

Murphy's Law: The adage that if something can go wrong, it will, often at the worst possible

time. We often overlook low-probability possibilities only to find projects delayed when they occur.

Parkinson's Law: The observation that work expands to fill the time allotted for its completion.

Project Buffer: A time buffer placed at the end of the project to protect the overall timeline from delays.

Project Flow: The smooth and efficient progression of tasks and activities in a project.

Resource Buffer: A buffer that ensures critical resources are available when needed to prevent delays in the critical chain.

Scheduling: The process of planning and allocating time for tasks and activities in a project.

Student Syndrome: The tendency to delay starting a task until the last possible moment, leading to a rush to complete it as the deadline approaches.

Subordinate Everything to the Constraint: The third step in Goldratt's Five Step Continuous Improvement Process, involving aligning all project tasks and resource allocations to support the critical chain.

Task: A specific, defined piece of work that contributes to the completion of a project.

Task Dependency: The relationship between tasks where the start or finish of one task depends on the completion of another.

Tempo: The speed and rhythm at which tasks and activities are performed in a project.

Theory of Constraints (TOC): A management philosophy developed by Eliyahu M. Goldratt that focuses on identifying and addressing the most significant limiting factor (constraint) in a process to improve performance.

Work Package: A defined group of related tasks within a project that can be managed as a unit.

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About the Author

Steve Bick is a polymath forester, which is just another was of saying he has experienced failure in many aspects of forestry, along with a few successes. His forestry practice encompasses everything from climate adaptation to stump measurements and the Theory of Constraints. Steve earned an AS in Conservation from Herkimer College, followed by BS and MS degrees from the SUNY College of Environmental Science & Forestry. He received a PhD in Forest Management & Economics from Virginia Tech. Steve is an SAF Certified Forester, an ACF member and a licensed forester in the State of Vermont. He works with public agencies, organizations, and businesses to enhance the forest product supply chain, solve problems and help advance forestry. Steve is the director of the Vermont Forest Business School, where he offers six-month programs for mid-career small business owners. He focuses on turning complex theories into simple, practical applications and contributes to the forestry community through his writing, mobile apps, research, and teaching.

Acknowledgements

A strange thing happened to me on the first day of May 2024. I found myself caught up on everything for the first time in eight years. I had on-going projects, to be sure, but no pending deadlines, and plenty of buffers in place before anything was due. There was no longer an excuse for not working on this book. Much of it was compiled earlier, if you consider heaping notes and lecture transcripts in a file folder compiling. There was substance but no structure, organization, or coherence. Worst of all there was no flow.

This window of writing opportunity coincided with my daughter Fern returning from college at the end of the spring semester. I jumped on the chance to have her read and comment on sections. She made it clear from the start that the stories and examples were the most interesting part and that I should include more of them. Not only are the stories fun to write, but they are also the parts that really show how CCPM is applied in forestry. Thanks to Fern for that great idea.

While I am on the topic of daughters, I have to mention Darby, who I turn to for all matters of style and appearance. She has coached me through all of the visuals I use in teaching CCPM and is responsible for designing the cover of this book.

Another daughter joined our family when I took a short break from writing for my wife's son Evan's wedding. Sophie proved to be the real project manager in our family by planning the perfect June Adirondack wedding in less than six weeks. The whole thing was flawless, and we believe she controls the weather.

Alison Berry can always be relied on to edit my work and tell me what is missing and how to make it better. She shares editing credit for this book with Fern Bick.

Coeli Hoover has been an enthusiastic proponent of CCPM from the first time I brought it to her attention. She advocates for handing off actual batons in project work. She provided a thoughtful mark-up of an early draft and was a continuous source of good ideas.

Jeff Benjamin convinced me to scrap thousands of precious first draft words. This made me sad and the book better.

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Jennifer Hartsig is the best of all project managers, and I am lucky to be married to her.

– *Steve Bick*

Books by Steven Bick

Timber Measurements: A Practical Guide for Working in the Woods

Forest Enterprises of the Adirondacks

Northern Tree, Timber and Woody Biomass Volume Tables

Adirondack Forest Owner's Manual

Harvesting Woody Biomass: A Small Business Guide

The Desktop Hardwood Log Reference Book

After Wood: Routes to Retirement

Timber Tempo: Project Flow in Forestry

The Landowner's Guide to Conservation Easements (with Harry L. Haney)

Continuous Improvement in Logging (with Jeffrey G. Benjamin)

A Note from the Author

Did you see yourself in any of the stories in this book? If so, you're ready for more. You're ready for a better tempo and a smoother workflow. Discover the transformative power of specialized training and assitance, tailored to the work needs of individuals, small businesses, public agencies and associations. With a proven track record and deep understanding of forestry and project management, my services are designed to deliver exceptional results by enhancing the flow and efficiency of your projects.

Premium Training Services

1. Intensive Workshops

Engage your team with high-impact, hands-on workshops that impart advanced project management skills and best practices. My workshops cover:

- Mastering Project Management Fundamentals
- Advanced Critical Chain Project Management (CCPM)
- Optimizing Forestry Projects
- Applying Sustainable Principles to Benefit People and Forests
- Custom Topics to Suit Your Work and Team

2. Flexible Remote Courses

Benefit from my in-depth remote courses, perfect for busy professionals. Gain expert knowledge in a supportive cohort of peers.

- Identifying and Optimizing the Project's Critical Chain
- Effective Task Prioritization and Scheduling
- Incentivizing Change, Cooperation, and Accountability

3. Exclusive One-on-One Coaching

Experience personalized coaching and consultation sessions. My custom approach addresses your specific challenges, providing actionable insights and strategies to drive your success. Work with me, and you'll always get a prompt response.

Comprehensive Consulting Services

Unlock maximum efficiency with expert critical chain analysis. Identify and streamline the longest path of dependent tasks and resource constraints to ensure timely project completion. My analysis enhances project flow, helping you manage risks and maintain the perishable force of momentum. Develop robust project management plans that align with your strategic goals.

Why Choose Me?

I earn my living by planning and completing wide-ranging forestry projects for landowners, public agencies, forest products firms, associations and myself (like this book). This work is sustained by timely and comprehensive results. My broad experience in forestry and the working landscape has armed me with an extended network of supportive peers. Join this network and grow with us.

No-Commitment Offer

Do you want to talk over a project with me? Send me a note at steve@northeastforests.com and I will get right back to you.

Thanks for reading,

Steve Bick

Need Credits?

Would you like to receive continuing education credits for reading this book? Visit this link to learn how to get them:

www.loggingchance.com/project-flow-in-forestry

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Vermont Forest Business School

The Vermont Forest Business School (VTFBS) was mentioned in several of the stories in this book. While the stories aren't real, the school is, and many of the program's graduates contributed to this book in some way. If you want to learn more about VTFBS, visit our website:

www.vtfbs.com

Timber Tempo: Project Flow in Forestry

Unlock effective project management for forestry with Steven Bick's *Timber Tempo*. Discover how Critical Chain Project Management (CCPM) can revolutionize your operations, improve the flow of forest products, help you practice better forestry, and contribute to your career success.

Inside, you will learn how to:

- Defeat the problems that are holding up your work;
- Optimize the critical chain of project events;
- Buffer projects safely without wasting time;
- Motivate cooperation among team members;
- Realize benefits sooner with timely completion; and
- Become a linchpin in your organization.

This book brings theory to life with case stories about people and situations you may recognize, including anxious state foresters, salvage loggers, petty tyrants, stalwart stewards, critical-thinking consultants, TIMO transitioners, lame land managers, aspiring lumber barons, strategic team leaders, administrative den mothers, proprietary procurement people, carbon-counting buffer beaters, mensurationist introverts, inertia-plagued skeptics, hunt club rivals and bald-headed empowerment foresters.

Perhaps you know some of them already?

A Vermont Forest Business School Publication