TOCICO CONFERENCE 2005

How to Systematically Tackle a Supply Chain

"Lessons Learned Along the Way"

Presented By: Debra A Smith, Constraints Management Group, LLC

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The First Opportunity - 1999

- A major manufacturer with a clear mandate from the top
- ½ billion dollars in sales revenue annually
- A single site of over 1 million square feet of manufacturing space
- 2,000 employees
- Global distribution with an exclusive, independent dealer base
- Global supply chain (German engines, Italian forgings both long lead time items)
- Complex engineering (over 100,000 different parts, hydraulics, gears, electronics and controls, circuit boards, steel structure, drive trains)
- Horizontally integrated manufacturing – fabrication, machining, assembly, electronics, assembly.
- Complex engineering challenges and on-going new product development and introduction.

What we did right

- We identified the technology issues and created in-house software solutions that provided real time buffer management for execution, signals for managing all of the replenishment buffers and scheduling of all of the control points between the links in the chain.
- Changed all of the accounting, reporting, floor measures and decision making reporting.
- Aligned the engineering control point to subordinate to the operations drum for scheduling engineering use of the tooling.
- Created a consolidated scheduling and replenishment inventory management function to coordinate scheduling the electronics plant, the drill pipe plant, fabrication and machining with the assembly and shipping schedules.
- De-segregated all resources human and machine capital as well as inventory and stock (after market sales of parts and service was a critical business factor with incredibly high throughput).
- Identified and changed the necessary vendor policies and got the key vendors to tour as well as sit through presentations on why the changes were a win-win.
- Identified the key conflict clouds that created push to the dealer base and changed the marketing policies.
- Met with the top ten dealers and developed the new replenishment system and dropped the 90 day order policy horizon to 14 days.

Results

- Three months from setting the strategic direction of the company we went live across the board.
- The first month they shipped 40% more than their previously record breaking month – They shipped everything that was in their backlog.
- The second month they shipped everything their dealers ordered 98%OTD. The dealers had been ordering five hoping for three (the good old beer game).
- Lead time Reduction: 90 days to 2 – 10 days (product dependent).
- Inventory reductions in excess of $36M in just plant inventory ($86M to $50M direct cash effect).
- Major capital Investment deferment (200,000 sq ft. facility).
- In-sourcing of several million dollars worth of business (direct cash effect) was achieved by the third month.

They thought we were incredibly successful but .....

- Service and aftermarket parts keep the dealer connected to the customer (the average piece of equipment will generate its selling price in parts and service every 3 to 4 years).
- In the past five year window the product line had expanded so rapidly that the dealers had not been able to afford to stock all of the aftermarket components and the equipment in their yard. This resulted in the birth of the "will fitter" industry.
- We were so intent on getting the new DBR, Replenishment, accounting and information decision making systems in place we did not prepare the executive team and the dealers for the changes necessary to create the future market opportunities.
- We did not predict the dealers behavior when the inventory was converted to cash. The average dealer got a 2 to 3 million dollar windfall when the lead time and order policy time went from 90 days to 10 days.
- Most dealers chose not to re-invest that money back into their dealership to shore up service and recover the aftermarket parts business.
- Four months later the market tanked (demand fell to half and returned to the level before the fiber optic cable infrastructure boom).

What we learned at the time

- No matter what the president says do not let ANY senior executive skip the initial strategic sessions, especially the sales and/or marketing executive.
- The chance you can make it up is very low and you will always be on the defensive and playing catch up!
- There is always a market cycle change coming. Sometimes you trigger it and sometimes it just catches you but the change is coming.
- Until you have operated and managed your TOC System through:
  - an internal constraint
  - an external constraint due to an industry downturn
  - an external constraint due to an economic downturn

  you are at risk. If you do not address the possibility and prepare a plan of action you will get caught and the cycles will teach you a hard but necessary lesson.

What we learned for the future

- Predict the three previous scenarios with your executive team and at a minimum make sure that the implementation strategy will account for recognizing they are a possibility.
- Additionally get agreement on the necessary immediate responses to put in place. Even if it is as simple as recognizing the shift in constraint focus and changing the pre-requisite order of our intermediate objectives.
- We developed the TOC decision making “rules” to teach how to down size and survive a severe market downturn while protecting the company’s constraint and ability to “gear back up” fast.
- Software is an integral and necessary part of the solution. As much as we disliked the idea, technology tools were becoming a necessary part of our solution set.

For the next two years we learned how to integrate project management

- We learned how and where project management fits in our market niche (manufacturing and distribution companies).
- We spent the next two years integrating project management back into our existing client base and interfacing the manufacturing and engineering drums.
- We began to define the “rules” for control point subordination between the links in the internal supply chain to include engineering and product development as well as operations and inventory management.
- We BEGAN to understand portfolio management from an internal supply chain perspective and how to allocate investment and resource decisions between the links and their markets.

EXAMPLE

2001 The next major learning opportunity

- Vertically integrated $1B wood products supply chain.
- 850k acres of timberlands owned and managed, 5 plywood mills, 2 particle board plants, 1 dimensional lumber sawmill and 1 engineered wood products (truss) plant.
- 2700 people.
- There is only one resource input for every plant and product group - the LOG. It's "abuse" is the major source of variation and waste from the supply side.

We started with the premise “No key” player escapes

- We did the strategic thinking session with a team from across the enterprise one level below the executive staff. They created a buy-in presentation of less than an hour that summarized their strategic analysis.
- We checked the presentation with small groups of people from each area of the company
- We then put each vice president in a room alone with the team to review the presentation and got their buy-in and comments in private and their agreement to say what they thought in a meeting with all of the vice presidents.
- We then put the vice presidents in a room together and got them to agree to stand united behind the work in a meeting with the president.
- We then put everyone in the room with the president and the team to present their work and gain agreement to implement the enterprise wide solution set and top down education.
- Until the meeting with the president no one could predict what the president/owner’s reaction would be to the first key agreement point.

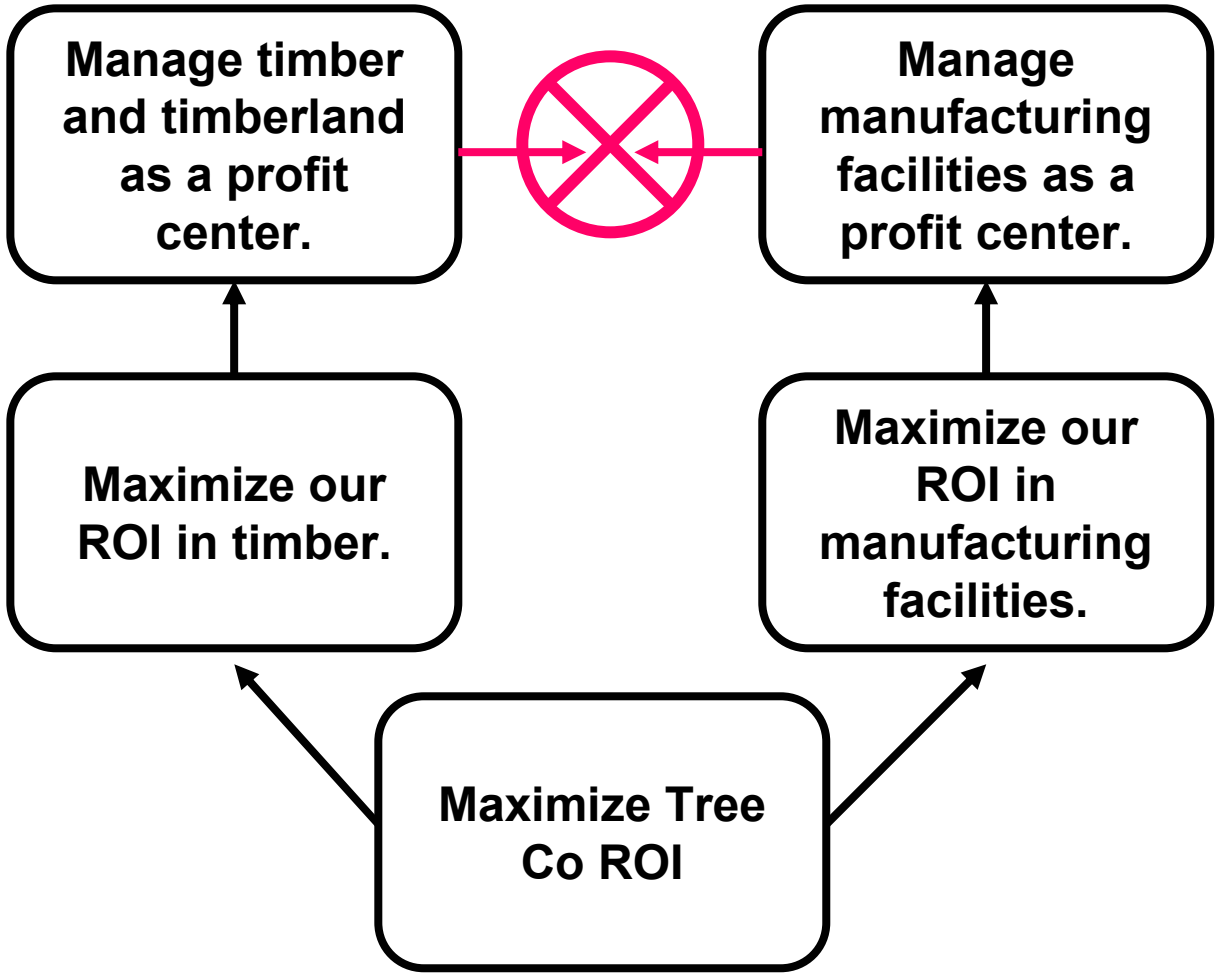
The first key agreement point

Agreement on the strategic objective of the company assets:

Why did we invest in them and what is their strategic objective and their relationship to each other?

No one was sure or even agreed if the owner had forests to support his manufacturing investment or had manufacturing investments to have as an alternative avenue to make the most money from forests.

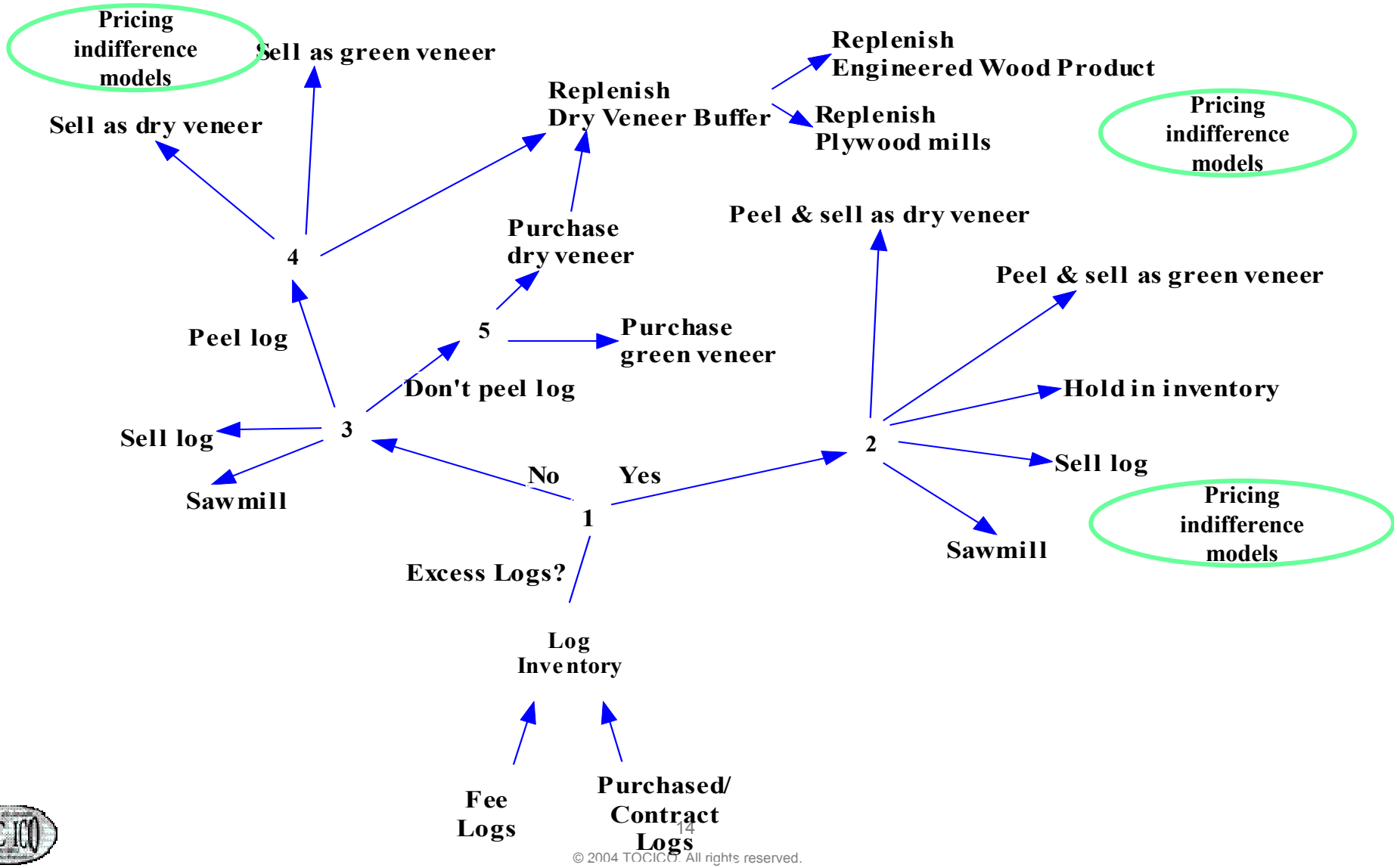
Ye Old "Local-Global" Conflict



If the input links can sell internal and external WATCH OUT!

- You must solve this cloud first and the solution of this cloud will always involve the elimination of transfer pricing and the allocation of corporate overhead between plants, business groups and product lines.
- A definition of the strategic contribution metric for every link in the supply chain.
- How strategic is the input link to the end item product's throughput? This will determine the direction for the solution.
- Only when we understand and get agreement on this can you look at capacity and identify the pacing and flow control points and the necessary buffers.

Wood Products Internal Supply Chain Throughput Points Decision Model



The steps we followed:

- Define the supply chain.
- Identify the truly scarce resource and or the most variable resource.

Creating a demand driven schedule through the supply chain

- Everyone agreed the true scarce resource and the major source of variation throughout the supply chain was not having the right log. The variation introduced into all of the plants by not having the right log, at the right time was the source of the major disruption and variation throughout the rest of the supply chain.
- The competition for the “right” log was fierce and they had failed to define what the “right” log really was (bad unit cost measures and local productivity measures). They were competing for the “wrong” log while the “right” log was sold or rotted.
- The only way to guarantee the right log can be milled was to sort all of the logs in all of the log yards by end product characteristic of the veneers they would produce.

The magnitude of the dilemma:

They operated the largest plywood plant in the world and on any typical summer day 160 log trucks delivered logs to the yard.

All of the plywood and the veneer plants had log yards.

Logs were not graded or sold by what they would produce for an end item but by total volume of wood they would produce.

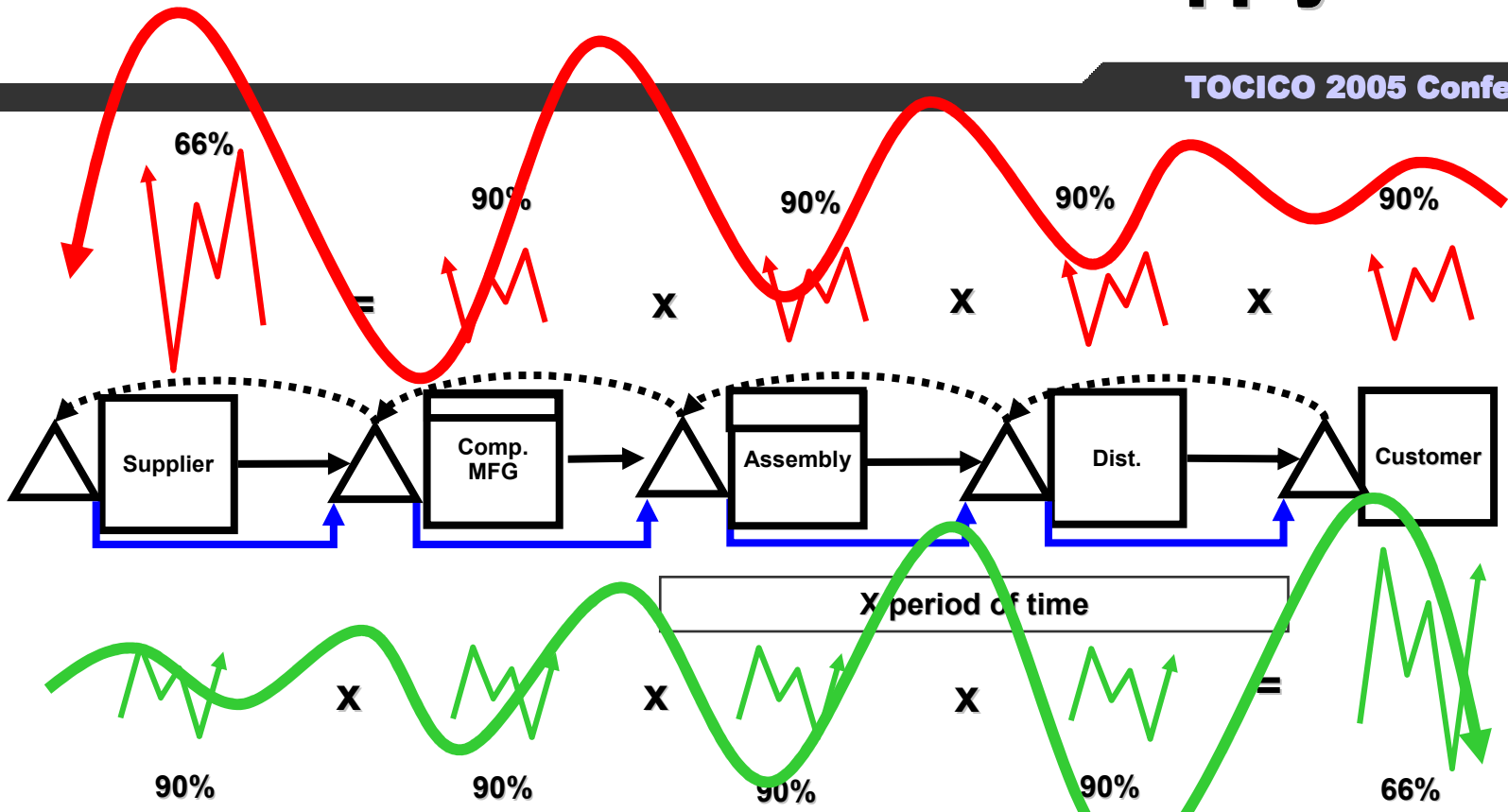
6,000 end item skus all with their own veneer formula.

We needed to understand what characteristics different logs types could be predicted to deliver when they were milled and then pre-sort the logs by the characteristic of the log.

Everyone also agreed that without this part of the solution we would fail to get the results we wanted.

Why?

The net-effects of variation on supply chains



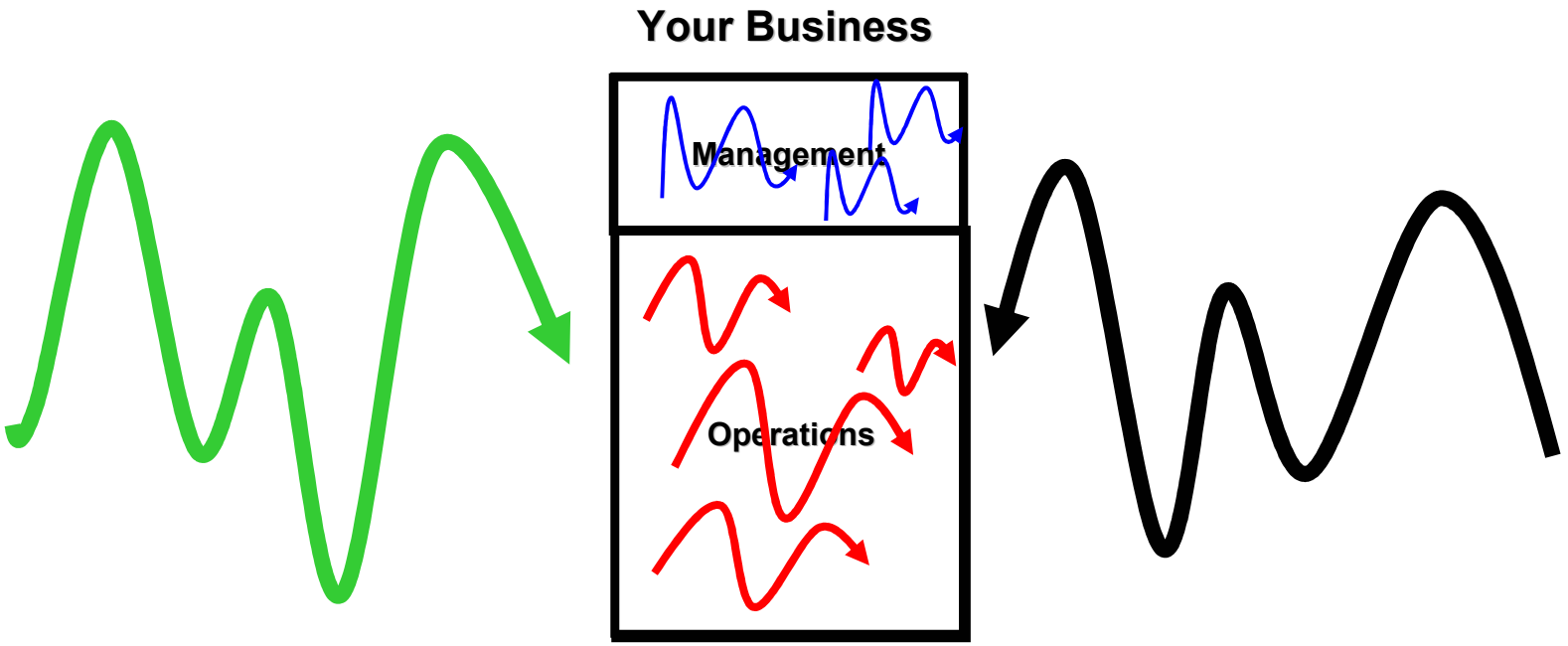
The Bull-Whip Effect

On both the demand and supply side, it is clear that the system variation is significantly higher than the variation of any one of the parts. The more parts, the worse the effect.

Non-Linear Transference Rule

It's also clear that there is not a linear relationship between reductions in variation in one part and the reduction in the system variation.

What is and how does variation impact a demand chain?



There are Four Distinct Sources of Variation:

1. **Fluctuations in demand**
2. **Fluctuations in supply**
3. **Random Events (Murphy) within our processes**
4. **Self-Imposed variations – over-reactions and under-reactions in what we decide to do**

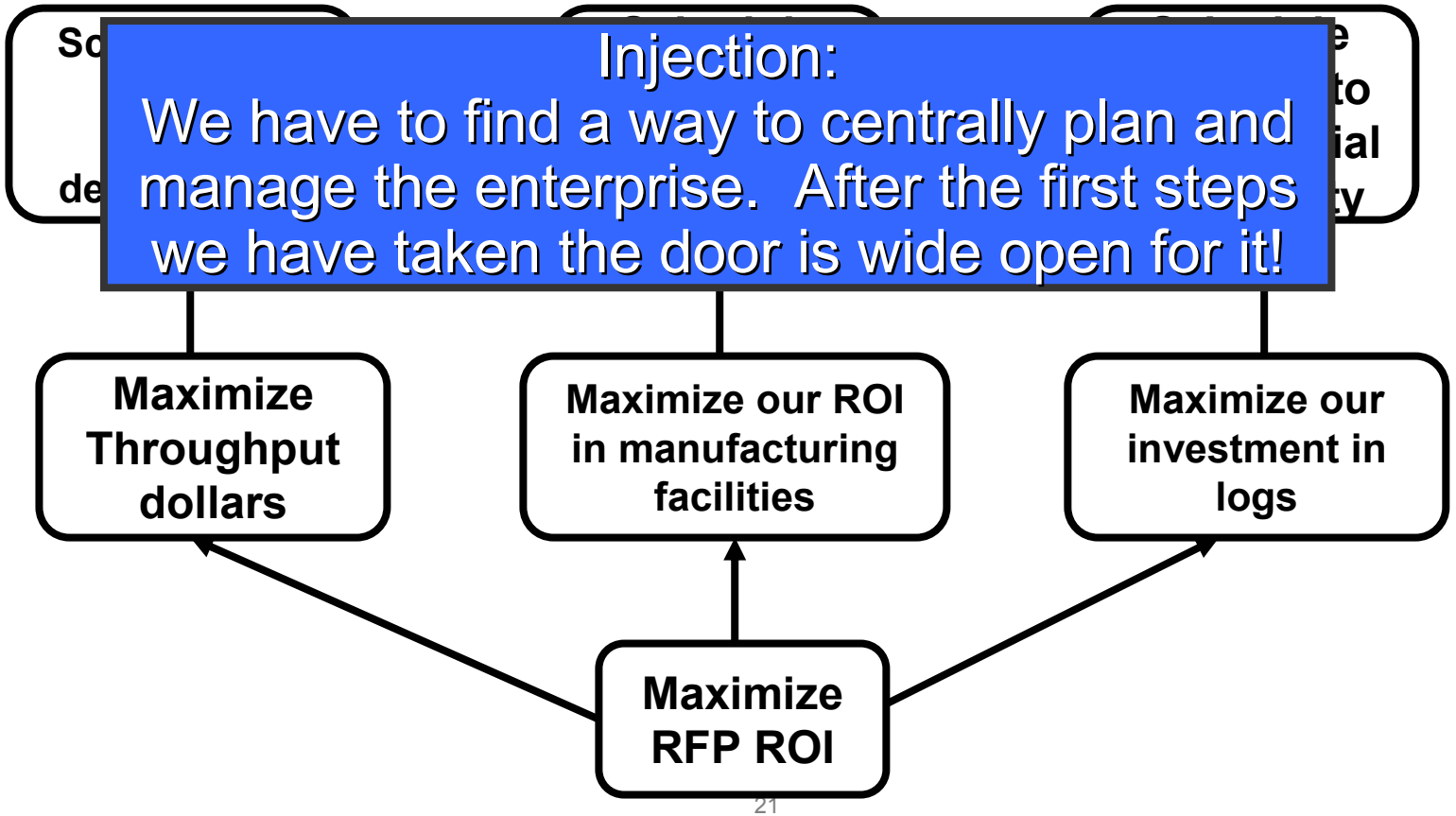
The steps we followed:

- Agree on the criteria for allocation decisions and who is responsible for the allocation of the scarce resource input.
- Our experience shows that getting control of the input source of variation and conflict causes immediate benefits throughout the supply chain. Everyone experiences the WIN.
- Do it quick and you have a measurable success that creates tremendous momentum to carry you through the rest of the supply chain implementation.

Only now can we begin to tackle designing a system to schedule capacity to market pull

Underlying assumption:

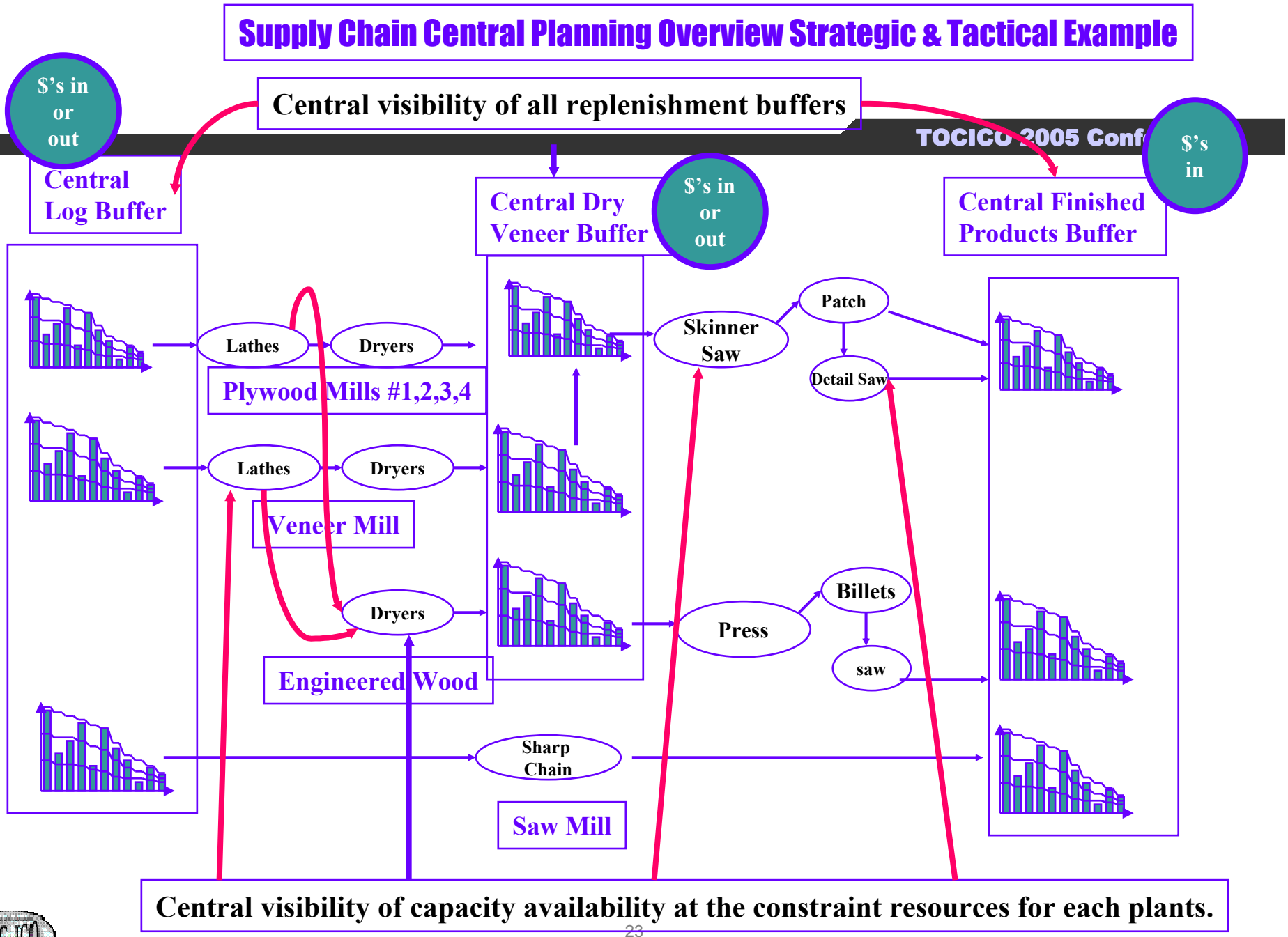
There is no way to match raw material availability, capacity and inventory to market demand.



The Challenges to get to Central Planning

- The organization structure did not exist. No one authority or system had the knowledge and visibility to de-conflict and solve scarce resource contention or allocate orders between plants with available capacity.
- The software technology did not exist to support the concept.
- The management information system did not exist.
- We had to apply the concept of "segment your market not your resources" across the enterprise not just a plant or any business/product group.
  - A lathe is lathe, a dryer a dryer and a log in your yard can be a veneer in my plywood plant tomorrow or a veneer in the truss plant tomorrow.

Supply Chain Central Planning Overview Strategic & Tactical Example



Results

- Reductions in inventory in excess of $50M (>35%).
- ROI from .5% (the past best ever was 4%) to 15% in 12 months, 19% last year.
- 20% Increased volume in plywood with 1.5 less plants (450 less employees) within the first six months.
- OTD from mid 40's to mid 90's (measured against a mixed product shipment).
- Lead time from 14 days to 2 days.

The year after implementing they shipped 40% more throughput with 30% less logs and one less plant (the plant was very old and set up for old growth timber the decision to scrap it vs. retool could finally be made because of the tremendous increase capacity unleashed)

Remember the scarce resource is the log and if they don't cut it - it keeps getting bigger!

We took the concept of sorting logs to the forests and planned their cuts by the characteristics the forest harvest would deliver.

What we learned at the time

- We could no longer ignore software as part of our integrated service offering.
- Integrating software into the solution set keeps the system from being circumvented or dismantled.
- You cannot afford to leave out any part of the supply chain if you want the organization to be sustainable in using TOC to manage from.
- We gained the confidence that we could manage complex supply chain implementations like LeTourneau.

Questions?