



POINT OF VIEW

OX Value Chain Optimisation: Simplifying and aligning operations for measurable impact

INTRODUCTION

Mining operations executives, does any of the below sound familiar?

- My operations improvement efforts are not translating to improved bottom-line profit
- My teams are overloaded with improvement initiatives
- We all operate in silos, optimising our local areas without an understanding of how the work we do helps achieve the business' goal
- My operations are complex, and I don't know where to start improving (without improving everything, everywhere all at once)
- When faced with a conflicting operational priority / decision, my team make different decisions depending on their personal biases
- My team's default position when faced with a Constraint is to throw Capital at it

Theory of Constraints has taught us that the **overall capacity of a system is driven solely by the slowest unit operation** (Constraint) at any point in time.

This simple concept is profound in its implications:

- We only need to **improve capacity of one unit operation (Node) at a time** to increase the overall system capacity (which means improving capacity at other Nodes delivers ZERO value, well actually it destroys value because it consumes additional resources to deliver this capacity without delivering benefit to the system)
- The purpose of all other Nodes (non-Constraints) is NOT tonnes but to:
 - **Support the Constraint Node** (product quality, adequate live product inventory, shared resources, eliminate delays to Constraint Node etc.)
 - **Eliminate waste and hence cost** (over production, under-utilised resources, recovery etc.)

In this Point of View, we argue that **this simple concept enables the following benefits:**

1. All operations improvement efforts translate to **bottom-line profit**
2. Significantly **reduced workload**
3. **Breakdown of silos** across the Value Chain
4. **Simplification of your business** and Value Chain
5. Improved operational **decision making**

Whilst the concept is simple, implementing requires some work (and thinking).

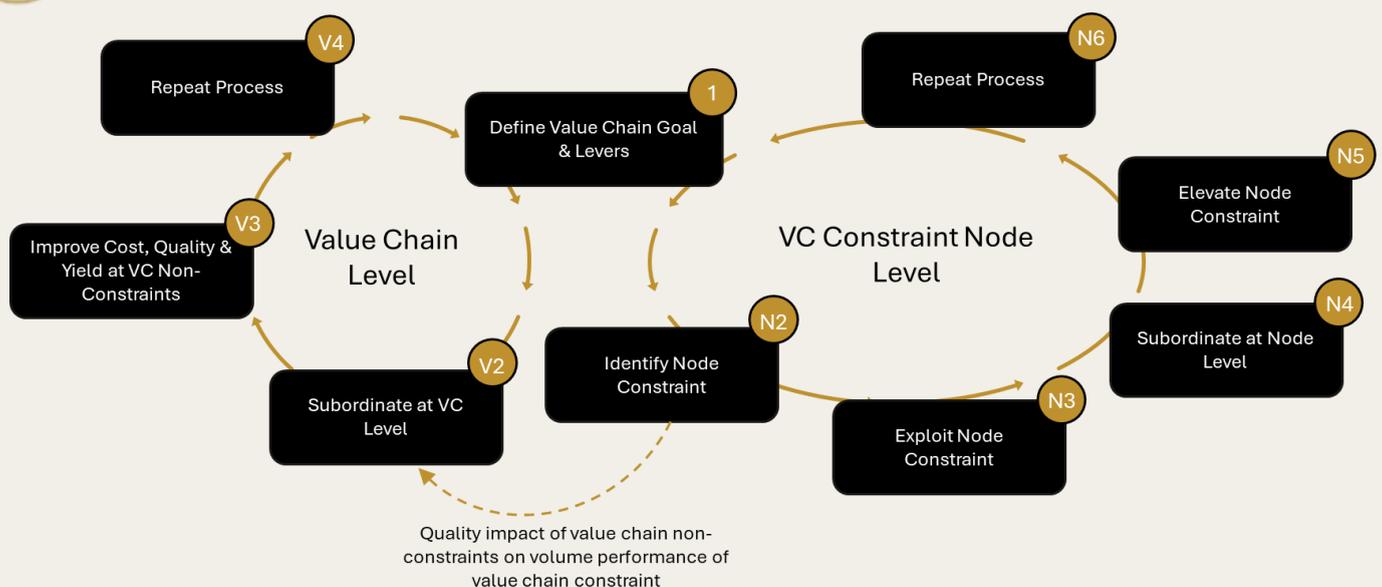
Built on the Theory of Constraints (TOC), **OX's Value Chain Optimisation Framework** focuses on the flow of value (volume, quality, yield & cost), not just flow of material.

What is Value Chain Optimisation (VCO)?

Value Chain Optimisation (VCO) is a **capability that links an organisation's strategic goals with the work that must be done by the Value Chain to achieve these goals.** It does this by continuously and systematically identifying and addressing Value Chain Constraints at the different levels (Value Chain level and Node level).



Value Chain Optimisation Framework



OX's Value Chain Optimisation Framework focuses on the flow of value (volume, quality & cost), not just flow of material.

In this Point of View, we discuss **3 main topics**:

- I. The importance of defining the Value Chain Goal and key levers.
- II. How subordinating at the Value Chain level creates an aligned operating philosophy and delivers larger bottom-line results with reduced effort.
- III. Why identifying, exploiting, subordinating, and elevating constraints at the node level is critical to optimising the value chain.

I. Defining the Value Chain Goal and Key Levers

Most organisations are aligned on the concept of value and that we must all find ways to add value to the business. But when we ask the following questions, we get many varying answers:

1. **How do we measure value** (Net Profit, All-in Unit Cost, NPV, etc.)
2. **Which levers contribute the most** to the agreed measure of value (Volume, Price, Product Quality, Product Mix, Variable Costs, Fixed Costs)?
3. **What is constraining us** from delivering more value?

So how do we expect our people to “add value” to our business when we haven’t defined and aligned what we mean by this?

Imagine if we were able to set a goal that says:

“To maximise Net Profit (or your chosen measure of value) now and in 5 years’ time by maximising total product volume delivered to the customer with an increased proportion of Product X (as opposed to Product Y)”

This simple statement gives so much clarity to what the business should be focused on.

OK, makes sense. But **how do I determine what’s constraining me from maximising total product volume?** Sorry, to say, but the answer to this is “it depends”. It depends on:

- The **complexity** of the Value Chain
- The **amount of live inventory** between Nodes
- Whether the product has unfulfilled **demand** or not
- The **variability** of the Value Chain (and the underlying Nodes)
- The **availability, granularity and accuracy** of inventory and production data

The most basic way to determine this is using a **Line Balance and looking for the Node that has the lowest average Capacity**. The most sophisticated way requires a Value Chain level loss-accounting model using near real-time data. Further complicating constraint identification is that there are many types of constraints such as Physical, Planning, Policies and Paradigms. This is where having the right people on the team helps.

Given the capacity of the Value Chain is entirely dictated by the Constraint at that time, **all volume improvements should be focused on the Constraint**. This means that the KPIs for the Constraint department (Node) will be Volume (more tonnes!!).

So, do the departments (Nodes) that aren't the Constraint not have to improve? No, non-Constraint Nodes have a very important role to play. Subordinating to the Value Chain Constraint (more on that in a moment) and eliminating waste. **So non-Constraint Node KPIs will normally (but not always) be focused on Quality, Yield and/or Cost**. In

summary, the output of this step is:

- **A published Value Chain Goal statement**

- **Agreed Value Chain Constraint(s)**
- **KPIs for each department (Node) which links directly to the Value Chain Goal and the role the Node plays in achieving this**

II. Subordinating at the Value Chain Level

We briefly mentioned Subordinating in the last section. So, **what is Subordinating?**

Subordinating at a Value Chain level relates to all non-Constraint Nodes supporting the Constraint Node to operate at its full Capacity, all-the-time (i.e. reducing variability at the Constraint Node).

In practice this involves the deliberate reduction in Capacity or increase in Cost of non-Constraints to:

For Nodes **upstream** of the Constraint:

- Ensure all inputs to the Constraint are available when needed (maintaining appropriate live inventory in front of Constraint)
- Maintain a healthy level of queuing (another form of inventory) in front of the constraint
- Produce a product quality that “flows” better through the Constraint

For Nodes downstream of the Constraint:

- Ensuring the outputs of the Constraint can always be processed (downstream inventory never fills)

For all non-constraint Nodes

- Provide resources (including people) to the Constraint
- Change recurring event times (i.e. blasting) to minimise impact on Constraint

Ultimately, **it's about reducing variability of the Constraint.**

This bit is often the hardest to implement as we are all so used to measuring our performance based on Volume.

A shift in mindset from an inward mindset (how do I achieve my goals) to an outward mindset (how do I help others achieve their goals) is required. See [*Accelerating your productivity program through a people-first approach*](#) Point of View for more information.

The tool for achieving Value Chain Subordination is called a **Value Chain Operating Philosophy.**

A Value Chain Operating Philosophy is a document that includes:

- The **outputs** from Step 1

- The Value Chain **tactics**
 - How each Node will Subordinate to the Constraint and how it will be measured e.g. Drill & Blast Particle Size Distribution >XX% passing YYmm
 - How the interfaces will be operated e.g. what is more important at the Mine/Plant interface, reducing truck queue time or reducing crusher bin empty time? How will this be measured?
 - How planned shutdowns will be managed (including the lead in) to minimise impact on the Constraint and how it will be measured

The Value Chain Operating Philosophy is then used as a decision-support tool for the following (not exhaustive):

- When deciding where my scarce resources are allocated (capital, improvement people, etc.) – as part of Annual Planning and Budgeting
- When setting team goals
- When determining what measures should be included in Visual Performance Centres
- When valuing and prioritising improvement ideas
- When determining where to remove cost from the business (removing costs from Constraint Nodes often destroys value)

In summary, the **Value Chain Operating Philosophy is the primary mechanism to define and enable the subordination of non-Constraint Nodes to the Constraint Node.**

III. Optimising at the Node Level: Identify, Exploit, Subordinate, Elevate

Now that every Node is aligned on how it delivers value to the Value Chain, their Continuous Improvement capability can be set loose on the right levers.

When it comes to optimising the Value Chain Constraint Node, **the traditional Theory of Constraints approach can be leveraged which includes:**

 **Identify:** Identify the process step or equipment that's constraining the Node

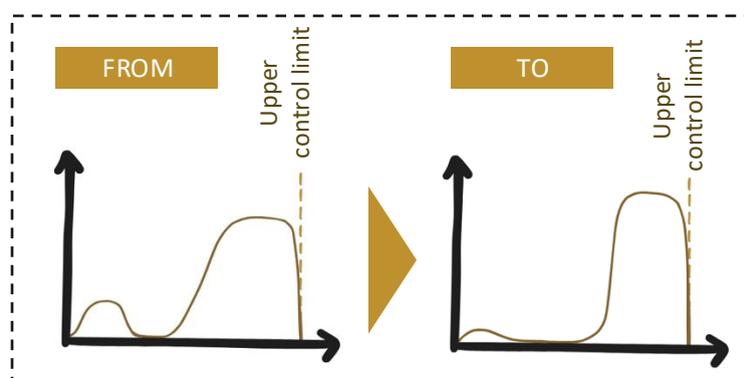
 **Exploit:** To make full use of the Node Constraint (i.e. run it a full capacity) by reducing variability and control

 **Subordinate:** Further reducing variability of the Node Constraint by ensuring all Node non-Constraints are supporting the Node Constraint (e.g. utilising small buffers such as surge bins to protect the Node Constraint).

 **Elevate:** Increase the upper limit of the Node Constraint through process redesign, equipment upgrades, additional equipment, etc.

Identifying a Node Constraint uses different methods to identifying a Value Chain Constraint. The first step is always to map and categorise the underlying process (is it a cycle, series, parallel, continuous etc.). Depending on the process categorisation, the type of analysis to identify the Node Constraint varies. This is where having the right people on the team helps.

The Exploiting and Subordinating steps involve reducing the variability of the Node Constraint so that it can run closer to it's Upper Control Limit more frequently (see below image). This may involve optimising the control system, training/coaching your people, improving equipment reliability etc. **Six Sigma is the ideal methodology for this.**



A common example we see is in the Ship Loading Circuit of a bulk commodity where a reclaimer feeds a surge bin which then feeds the ship loader.

The Goal of this sub-system is to load the ship as quickly and reliably as possible. In this scenario, the reclaimer is (or at least should be) the Constraint. So the rest of the sub-system (i.e. the surge bin and ship loader) should subordinate to the reclaimer.

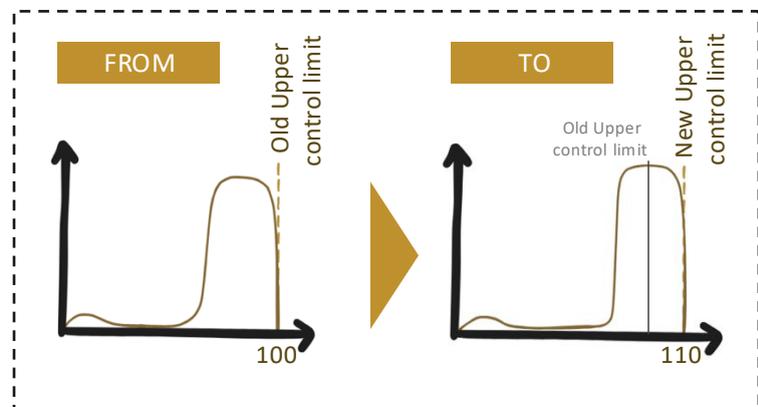
Now, hatch changes are an inevitable part of the process which requires the ship loader to stop for short periods of time whilst it moves to the next hatch. The purpose of the surge bin is to eliminate or at least minimise the impact of hatch changes on the reclaimer (the Constraint). To achieve this, the surge bin tactic should be to ensure the level is as low as possible immediately before the hatch change starts so that the reclaimer can continue to run for as long as possible during the hatch change.

However, what we often see is the tactic of maintaining the surge bin level as close as possible to 50%. This tactic results in the reclaimer (the Constraint) having to stop earlier during a hatch change and therefore results in the ship taking longer to load (counterproductive to the sub-systems goal).

Whilst this is a simple example, we see these examples everywhere in mining.

The last step is Elevate which involves increasing the Upper Control Limit (see below image).

We often see teams jump straight to solutions that involve spending money (upgraded equipment, additional equipment etc.). **OX have an interim step called Process Full Potential.**



So, what is **Process Full Potential**?

Well, we've all heard that, when designing equipment/processes etc., Engineers include a significant design margin to reduce the risk of it not achieving what it was designed to do. This often means that there is additional capacity in our equipment that we are not aware of.

Just because an Apron Feeder says on SCADA that it's running at 100%, doesn't mean that's as fast as it goes, we are constantly amazed at how often you can find this opportunity if you ask the right questions. This is an example of Process Full Potential, but there are many more.

In summary, **optimising the Value Chain Constraint Node leverages the traditional Theory of Constraints approach of identify, exploit, subordinate and elevate** with a little OX know-how to do it using low/no capital.

While the Value Chain Optimisation (VCO) framework offers significant potential benefits, some common concerns may arise regarding its practicality and alignment with broader business needs. Let's explore and address these concerns.

“It's Too Narrowly Focused and Misaligned with Strategic Goals”

While VCO emphasizes Constraint Node optimisation, some may worry it neglects broader business priorities like ESG, workforce development, or market positioning. However, **VCO can be aligned with strategic goals by integrating ESG metrics and long-term planning into its framework.**

For example, subordinating non-Constraint Nodes can be designed to support sustainability initiatives or improve energy efficiency while maintaining focus on profit. With proper alignment, VCO becomes a bridge, ensuring short-term operational gains complement long-term strategic imperatives.

“It Takes Too Much Effort to Change How We Work”

The shift required to embed VCO may seem overwhelming, particularly for teams accustomed to measuring success by local KPIs. However, **this transformation materially simplifies the business by removing all the work that does not add (or often destroys) value.**

By creating clarity around the Value Chain's Goal and aligning KPIs across departments, operational silos are dismantled, and efforts are concentrated where they matter most. While there's upfront effort required, in the medium-term it avoids the perpetual drain of resources caused by uncoordinated improvement initiatives and conflicting priorities.

“We Don’t Have the Data or Tools to Implement This”

It’s true that successful VCO relies on high-quality data and analysis, which may seem daunting for organisations with legacy systems or limited analytics capabilities. Our experience is that most of the required data exists, it’s just in disparate systems that require effort to integrate. Further, **VCO can be adapted to work with existing data by starting with simpler methods, such as basic line balancing, while gradually investing in enhanced analytics and real-time monitoring.** This staged approach ensures that teams can begin to identify and exploit Constraints without waiting for a full digital transformation, building momentum and confidence in the process as capabilities grow.

CONCLUSION

The Value Chain Optimisation (VCO) framework offers a transformative approach to aligning operations with strategic goals. By focusing on identifying and addressing Constraints at both the Value Chain and Node levels, organisations can break free from inefficiencies, reduce operational complexity, and drive measurable bottom-line profit.

VCO challenges the status quo of siloed thinking and resource-heavy improvement initiatives, replacing them with a clear, systematic process that **prioritises what truly matters.** While the shift to this mindset requires effort, the benefits are profound: simplified operations, enhanced decision-making, and a culture of collaboration that maximises value.

At its core, **VCO is not just about operational efficiency—it’s a strategy for achieving sustainable growth.** With its alignment to overarching business goals and its ability to scale from basic analysis to advanced capabilities, **VCO equips organisations to thrive in an increasingly complex and competitive landscape.** Embracing this framework is not simply a step forward; it’s a leap toward long-term success.



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