



TOCICO is pleased to recognize this paper as part of the TOC Body of Knowledge.

The Fundamental Structure of the Theory of Constraints

By Eli Schragenheim and David Updegrave

The Theory of Constraints (TOC) is a pragmatic management theory that leads managers to bring their organizations to significant ongoing improvement without incurring real risk. TOC is based on using the scientific approach (cause-and-effect thinking) to explain the current state and construct robust solutions to improve it. Therefore, every element must be clearly defined, and all ramifications of any action must be evaluated.

This paper's objective is to provide the basic knowledge for novices through experts in specific parts or applications of TOC to understand the wide scope of TOC and its key high-level structure, how its parts interact and how they inspire additional insights that result in this significant improvement for the organization. We think that understanding the way, from very high-level insights that may seem too abstract to be practical, to the much more down-to-earth applications of TOC, will significantly help in expanding the current knowledge to other environments and lead the way for unlimited, yet secure enough achievement of the goal.

We claim that every beneficial insight removes a **limitation**¹ that prevents us from achieving something valuable (more of the goal). Limitations addressed by the Theory of Constraints (TOC) often stem from flawed paradigms or assumptions. Once these limitations, with the untapped value they hinder, and the flaws in the existing paradigm are evident, managers become receptive to exploring fresh opportunities. Successfully challenging common yet flawed paradigms not only overcomes limitations and adds value, but also propels organizations ahead of their competitors still ensnared in the old paradigm. Competition is another limitation we always look to reduce.

Explaining a new insight through the definition of the limitation and its associated flawed paradigms reveals the applicability of the insight, as the scope of the identified flawed paradigm can be wider than the specific limitation we would like to overcome. The potential new value from eliminating current limitations just by realizing the flaw in a common paradigm could be huge.

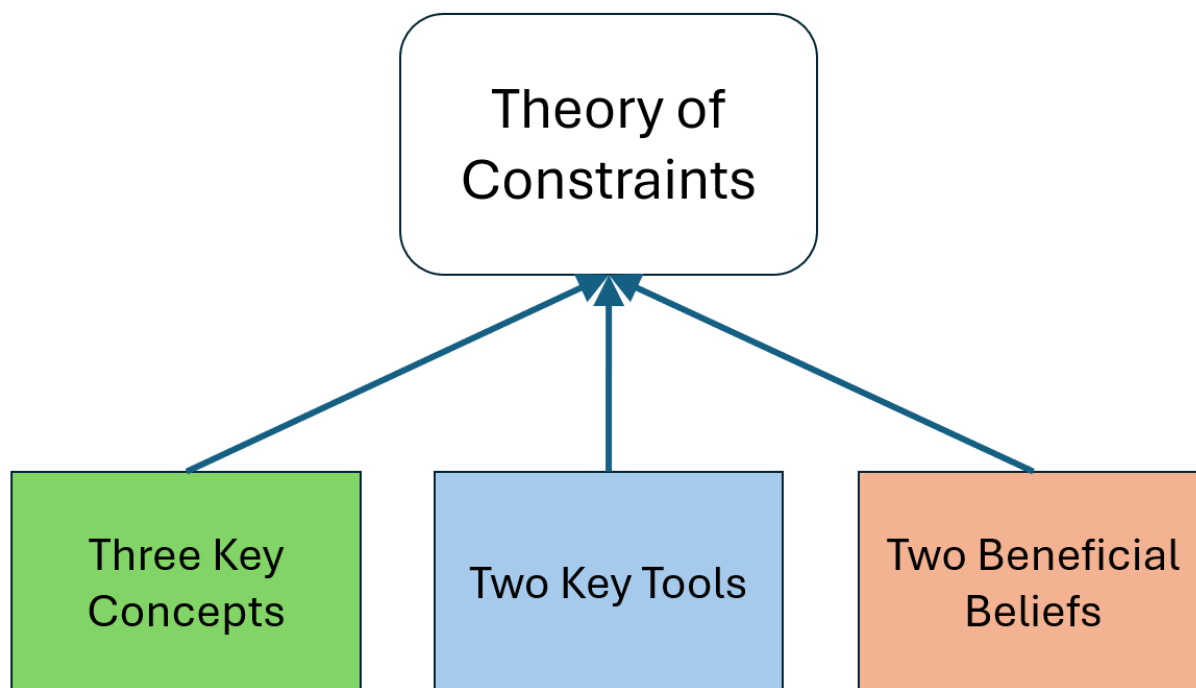
TOC has challenged several key common paradigms. The main idea behind this paper is to produce an illustrative diagram of TOC's structure, with each concept, tool, belief and insight bringing additional value by itself, and even more by the interaction between them.

¹¹ Limitation: An act or instance of limiting. Source: Merriam Webster Dictionary www.merriam-webster.com. Many things act as limitations in systems. Although every constraint is a limitation, not every limitation is a constraint. See the definition of constraint in the footnote on page 9

Understanding the seemingly abstract structure of TOC makes it possible for a good practical executive or consultant to quickly reveal new possibilities, practically “translating” the insights that have already proven their value to the reality at hand other types of organizations.

We believe there are seven fundamental qualities inherent to systems that TOC builds upon. These qualities, and how they interact and lead to more detailed lower-level insights and tools are not always obvious and need to be clearly detailed. Standing on the shoulders of giants such as Isaac Newton and leading the way for others, Dr. Eli Goldratt has applied clear thinking and the scientific process to discover them. Following his lead, we have broken down the seven qualities as follows:

- 1) Three key concepts that address the three fears of every manager: complexity (Inherent Simplicity), uncertainty (Inherent Uncertainty), and conflicts (Inherent Consistency).²
- 2) Two key tools (Inherent Causation and inherent Valuation).
- 3) Two beneficial beliefs (Inherent Potential and Inherent Goodness).



² These three fears are first referenced in Dr. Eli Goldratt’s unfinished manuscript, “*The Science of Management*”.

Drawn from these seven core qualities, we have further identified three resulting breakthrough insights (Inherent Focus, Inherent Control, and Inherent Value from Innovation). Each of these seven qualities and the three breakthrough insights overcome one or more limitations in our systems. It is anticipated that in the future, many more TOC insights and applications will be analyzed in the same way, and probably lead the way for new insights entering the TOC body of knowledge.

The Theory of Constraints has since its inception been evolving. By the time of his death in 2011, Dr. Eli Goldratt had identified four of the concepts and beliefs noted below as “The Four Pillars” of TOC. These four are Inherent Simplicity, Inherent Consistency (Every conflict can be removed), Inherent Goodness (People are Good) and Inherent Potential (Never Say, ‘I Know’).

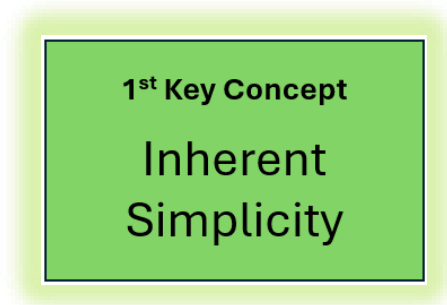
In his 2021 paper “The TOC Pillars”, Humberto R. Baptista contributed new terminology to three of the four pillars and added a fifth, “Inherent Tolerance”. We have included it here as “Inherent Uncertainty”, which we think is a more encompassing and descriptive term.

Although we are not insisting on the entities herein being described as pillars, this paper, remaining consistent with the concepts and tools described, presents an updated view.

The concepts, tools and insights are not presented here in the order they were introduced over the years. However, the thinking processes were already present and in operation at the time each was introduced.

Three key concepts – that address three fears of every manager (complexity, uncertainty, and conflicts)

To create a diagram originating from the most important flawed paradigms (limitations), we've started with the three key concepts, along with the first two breakthrough insights.



Inherent Simplicity³ addresses the fear of complexity. Consider the following statement:

Human organizations cannot afford to function in too much true complexity because their clients demand a minimum level of reliability from their delivery of value. Organizations that cannot reach this level of reliability will naturally collapse into bankruptcy.

If we accept this statement, it reveals the following limitation:

Being unable to predict the consequences of an action or imposed change well enough.

This failure to predict consequences vastly reduces the quality of decisions.

Flawed assumption: It is a generally accepted assumption that *Reality is complex*. From the perspective of managing organizations, this means every manager must be truly brilliant to consider all the variables that might impact the system, and even more so to predict their outcomes. Without being able to predict the outcome of every decision, the reputation of the manager is endangered, and possibly his or her future career.

³ Inherent Simplicity: The concept that nature is simple and harmonious with itself. One of Goldratt's original Four Pillars. Source of the term: *The Choice*, Chapter 4, Eliyahu M. Goldratt, North River Press, 2008. Goldratt believed this concept could be extended to human systems, e.g. organizations.

The second key concept, while different, acts in many ways together with Inherent Simplicity. This is the concept of Inherent Uncertainty.)

The point is that complexity and uncertainty interact together to create a system that must be simple enough to allow for not just being able to predict the total impact of an action on the system, but also to be able to assess the boundaries of the resulting impact due to the uncertainty. We'll discuss the interaction in more detail when we come to Inherent Uncertainty (see page 10). For the time being, let's discuss how what looks like a complex system is actually quite simple.

Whenever we want to remove a limitation, we should first understand how that limitation is handled today. But even before the limitation and the flawed assumption behind it are fully understood, clever people will find a way to deal with it (reduce its complexity; make it more manageable).

Therefore, the seemingly complex system is artificially divided into subsystems, assuming, 1) each subsystem is much less complex, and 2) this can help predict the local impact of any change. Managers hope that optimizing local systems will result in good enough predictions regarding the impact of their decisions on the global system.

This may provide some control, but it has demonstrably limited effectiveness. The quality of decisions is still inconsistent, and serious undesirable effects remain.

For example, Sales decides to announce a 'sale' of a specific product family in the first week of next month. They predict that sales of the chosen products will increase by 100% in the near term and cause future sales of these products to remain up by 5% after the sale is over (and the products return to their current list prices).

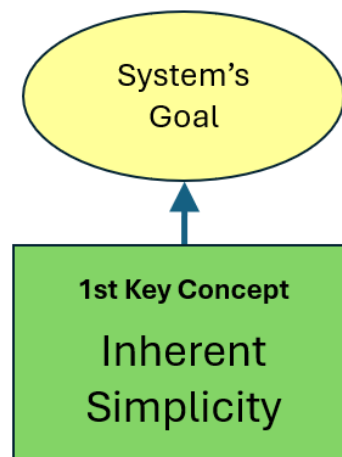
What might happen is that sales for this product family do indeed increase (a victory for the product line's sales team), but sales of other company products decline sharply. The reason is that Production has had to support Sales' emergent planning to create enough inventory for the product line on sale. In this scenario, Production gets this information at the last minute. This could disrupt the manufacturing of other products, making many of them late, and causing stockouts in the stores. Is there any logical connection between the decision of the Sales Department and the difficulties of Production? The answer is, yes, of course.

Requiring a subsystem (say the Engineering Department), to achieve its highest efficiency, without considering other departments, is a huge mistake that blocks innovation. Admitting that we are not certain at that moment of the root cause of our undesirable effects is much better, as it points us toward systemic thinking – to identify the system's *Inherent Simplicity* and lay out a causality map, eventually being able to come up with a working solution.

Treating our current reality as complex hinders us from making the effort to identify the *few variables* that significantly impact the consequences of any action or change, giving us leverage over the system.

Another negative effect

In an environment where every subsystem is expected to achieve maximum performance, the organization acts like it has a hundred (or a thousand) goals. The insight of Inherent Simplicity is profound, leading us to have to clearly verbalize the Goal of the entire System, otherwise, the ability to predict whether a decision would enhance the goal is impossible to make.



NOTE: Throughout this document, whenever arrows are depicted in drawings, it indicates the progression or flow of knowledge leading to the logical application.

Whether the topic is politics, the world economy, a war in Europe or the Middle East, or a social problem, we all hear too often that the “situation is complex, and there are many causes for it.” This is not only wrong, but it is also a damaging statement because it doesn’t lead to further efforts to identify the real core cause. We should first seek the Inherent Simplicity in any situation.

Summary

Inherent Simplicity – All systems (for instance, organizations), despite their apparent complexity, are inherently simple.

st 1 Breakthrough Insight

Inherent Focus

With Inherent Simplicity pointing us toward a systemic goal and the identification of core cause(s) of problems, it becomes apparent there should be an effort to distill or zoom in on specific areas of the organization. Continuing in this way of thinking leads us to our first breakthrough insight, Inherent Focus⁴.

Limitation: Being unable to focus on what is truly important for maximizing the performance of the organization, failing to achieve significant and stable improvement toward the system's goal.

Flawed assumption: We are subject to many problems and constraints that shift all the time.

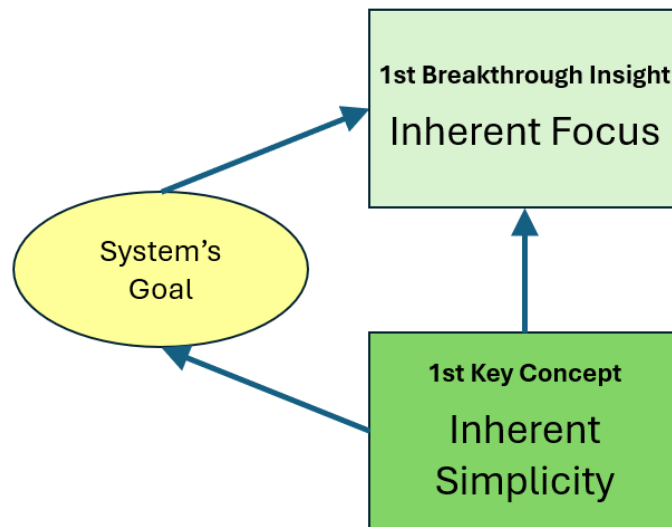
This assumption leads managers to try to make each part of the system more efficient, thinking that if each part of the system is efficient, the entire system will be more efficient. But cause-and-effect analyses prove that this assumption is also incorrect.

Many improvements in various areas have a very minor impact or no impact at all on overall performance. In fact, they may even introduce harm to the system – whereas improvement at the true constraint greatly improves the performance of the entire system.

Example of following the flawed assumption: Implementing policies driving local improvements.

⁴ Inherent Focus: All systems have one or a very few constraints that determine their overall performance. Once the system's Inherent Simplicity is identified, we can more easily use cause-and-effect analyses (and other methods) to find them. Source of the term: the authors, 2024.

Inherent Simplicity and the identification of a systemic goal lend themselves to pointing to where the **FOCUS** of managers should be directed. What should we focus on?



Every organization has one, or a very few, constraints that determine its overall performance. Inherent Simplicity leads the way to identifying the few variables that truly impact our ability to achieve the goal. This provides an opportunity to focus management attention on what limits the generation of value.

Many managers believe that they need to focus on every emergent issue (today's fires). However, without understanding Inherent Simplicity, finding the right focus is almost impossible. Thus, too many managers lose their focus as problems and their seemingly small possible improvements consume their attention.

We can maximize the performance of any system by identifying its constraint(s), deciding how we can best exploit them, subordinating everything else to this decision, and getting more constraint capacity when necessary.

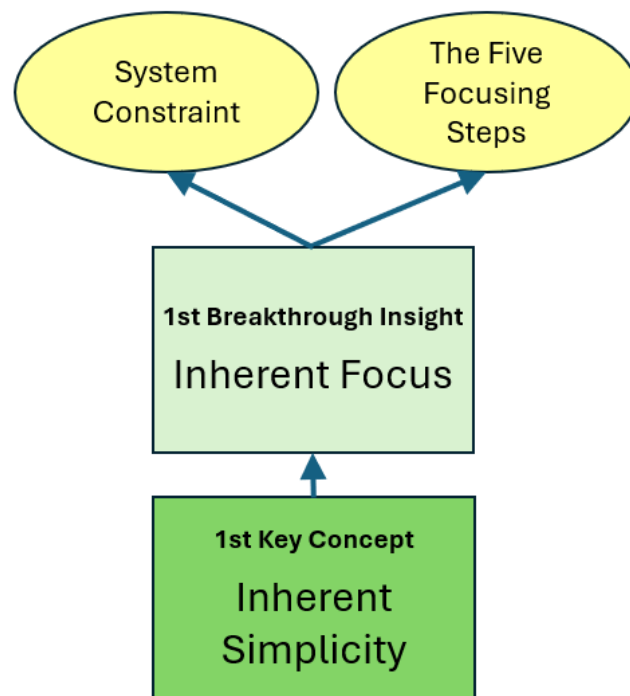
Focusing also means knowing what *not* to focus on at present. We all are constrained by the capacity of our attention. Thus, to focus on what is truly urgent and important, we should learn not to spend our limited capacity of attention on what clearly should not be in focus.

A secondary flawed assumption resulting from the above:

If we can make each part of the system more efficient, the entire system will be more efficient.

The effect of this thinking is that there may be many gains in efficiency in areas that have little or no impact on overall performance. Conversely, improvement at the true constraint greatly improves the entire system's performance. All the other resources should do their best to support the exploitation scheme of the constraint, which should always include meeting all the commitments to the market. Actually, the existing market demand should be always regarded as a constraint that requires subordination to the commitments that have been made. Still, an internal capacity constraint requires an exploitation scheme to determine what can safely be committed to the market.

This insight brings light on the creation of two principal revelations of TOC: the necessity of identifying the system's constraint⁵ and a set of focusing steps to deal with it.



⁵ Constraint – The factor that ultimately limits the performance of a system or organization. The factor that, if the organization were able to more fully exploit it, more effectively subordinate to it, or increase its capacity, would result in achieving more of the goal. Source: TOC Dictionary, Second Edition, 2012.

Summary

Inherent Focus: All systems have one or very few constraints that determine their overall performance. We can maximize the performance of any system by identifying its constraint(s), deciding how we can best exploit it/them, subordinating everything else to this decision, and getting more constraint capacity when necessary.

2nd Key Concept

Inherent
Uncertainty

The Inherent Uncertainty⁶ (fluctuations) within our systems interacts with the seeming complexity of our environment. Even when inherent simplicity means focusing on just one internal constraint, yielding an effective exploitation scheme, the reliability of our commitments might still be disrupted. Promising reliably might be compromised because of the possible accumulation of several routine delays. Any plan that seemed good at the time the plan was created might be too unsafe due to the random accumulation of common delays.

Limitation: We cannot systematically meet all our commitments to the market, including deciding when and what we can commit to market demand.

Flawed assumption: Optimal planning should take full advantage of all the available capacity and capability, offering perfect delivery on time and in full.

This assumption regarding the objective of planning comes from a conflict between maintaining full reliability and cutting the cost of capacity, assuming both are equally needed for financial success. The flaw is that in utilizing capacity in full, actual cost is not significantly reduced, because most resources don't need all their available capacity to cover demand. On the other hand, extra (protective) capacity is (absolutely) needed to ensure reliability.

The flawed assumption also explains the desire to measure the performance of every resource, in order to exploit its available capacity.

⁶ Inherent Uncertainty: All human-based organizations experience variation and uncertainty. Reacting to incidental occurrences ends up amplifying variability. Planning and execution must explicitly account for common and expected uncertainty with simple mechanisms, and we should react to only extraordinary ones. Don't optimize within the noise. Source of the term: the authors, 2024. Modified from the term "Inherent Tolerance" defined and coined in the TOCICO New Knowledge paper "The TOC Pillars" by Humberto R. Baptista, 2021
<https://www.tocico.org/general/custom.asp?page=TOCBodyofKnowledgeTheTOCPillars>
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Following the flawed assumption

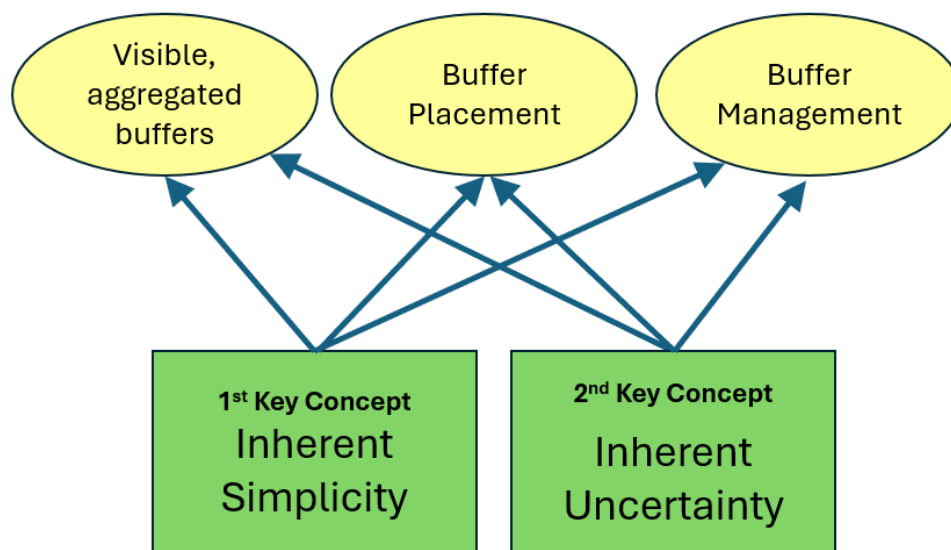
Human beings are aware of the noise in systems and include buffers in their behaviors. For instance, many people take extra time when they go to the airport, considering the possible fluctuations in traffic. However, the culture of organizations values optimization. They ignore uncertainty by relying on one-number forecasts, often turning them into targets that become officially what the organization, and the responsible manager, should achieve. The behavioral reaction is adding hidden buffers to every task, in addition to their forecasts and targets, and to make sure they never miss the target.

The essence of the flawed assumption, that we need to fully utilize all available capacity, has huge practical ramifications, the worst of which is to ignore common and expected uncertainty.

Note that both Inherent Simplicity and Inherent Uncertainty interact with each other because if high utilization of the capacity of every resource can be relaxed then Inherent Simplicity can be achieved, where one resource can be loaded almost to its limit, while the protective capacity of all other resources allow the required flexibility to keep promises intact.

Realizing this flawed assumption, it is now possible to remove the safety embedded everywhere and use **visible, aggregated buffers**, placed at critical points where the protection mechanism must be in place, like at delivery itself.⁷

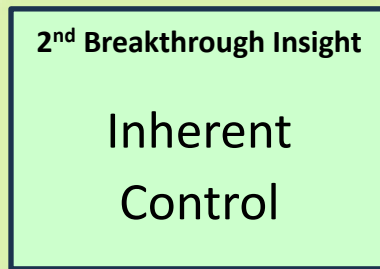
Another insight is Buffer Management, which creates a priority list for the people in the execution phase.



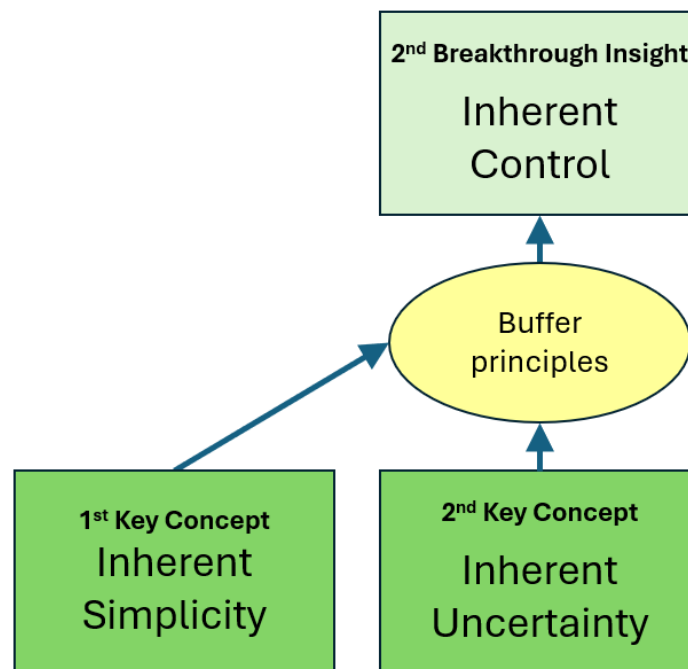
⁷ Shipping buffers in production, project buffers in projects, etc.

Summary

Inherent Uncertainty: Our reality is highly impacted by variability and other forms of uncertainty, which makes it tough to guess what we have to do to meet all our commitments to the market. Use buffering to account for common variations. Don't optimize within the noise.



Realizing the power of these concepts, we now understand we have additional capabilities. Inherent Simplicity and Inherent Uncertainty can be correlated to provide us with a huge benefit beyond simple buffering: Inherent Control⁸ is our second breakthrough insight.



Inherent Uncertainty and Inherent Simplicity together reveal the need for protective capacity and lead the way to the use of time and stock buffers at the appropriate locations. But common

⁸ Inherent Control: Given that Buffer Principles can handle most but not all uncertainty, Inherent Control means the system can quickly identify signals that point to the possibility of an emerging threat to an important objective and be able to take corrective steps in time. Source of the term: the authors, 2024.

and expected uncertainty still might prevent, from time to time, truly excellent delivery performance.

Limitation: Even with buffers protecting delivery dates, arbitrary accumulation of delays sometimes hurts truly excellent delivery performance.

Arbitrary accumulation of load on the capacity constraint could lead to pressure causing unavoidable delays.

Flawed Paradigms

1. Prioritizing work orders is a complicated mission, considering the size of the order, the importance of the client, and the efficiency considerations of the work centers.
2. Peaks of load on many work centers force frequent re-consideration of what to do next.
3. We do the best we can considering the complexity.

The direction of overcoming the first flawed paradigm is to measure the actual consumption of the time or stock buffers and prioritize accordingly. This is the essence of Buffer Management⁹.

Overcoming the second flawed paradigm requires effective control of the load on the constraint. This is called Planned Load, and it is measured by the number of hours of work required to process all the already planned work orders for that work center.

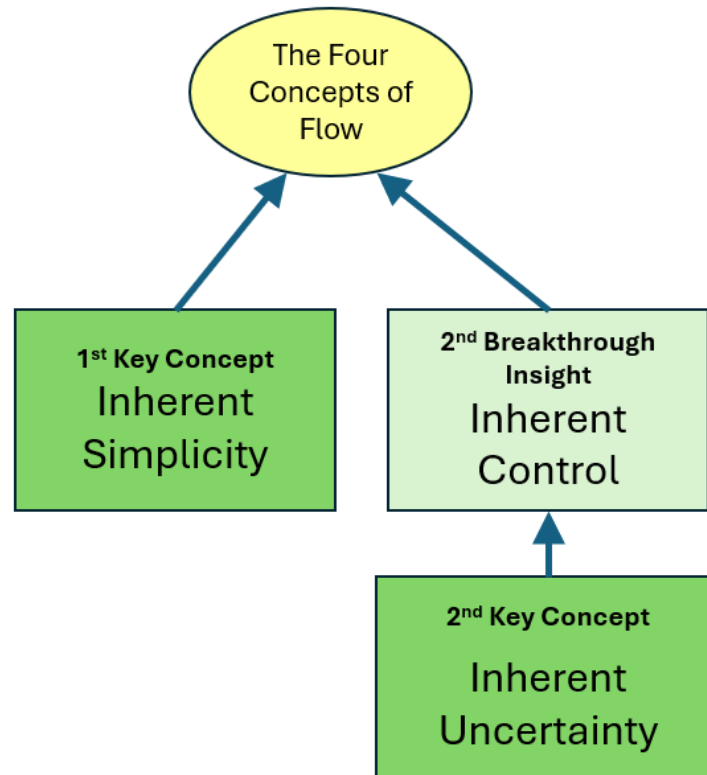
When the planned load grows, it can threaten commitments to the market. Thus, a limit for planned load is required: any real risk of being unable to meet all commitments should be determined a priori. When the limit is approached, Sales should take steps to restrain demand, reduce the level of commitment to the market (e.g. increasing quoted lead times), or Production should find ways to increase the capacity of the constraint.

Eventually, two elements are critical for having full control of the flow to customers.

1. Buffer Management, including a clear single priority scheme to decide what to do next (and to keep the number of red orders under control).
2. Planned Load, which is an effective capacity measurement that points to whether a lack of capacity at the weakest link might create pressure, even chaos, in delivery performance, allowing taking timely steps to face the situation in good control.

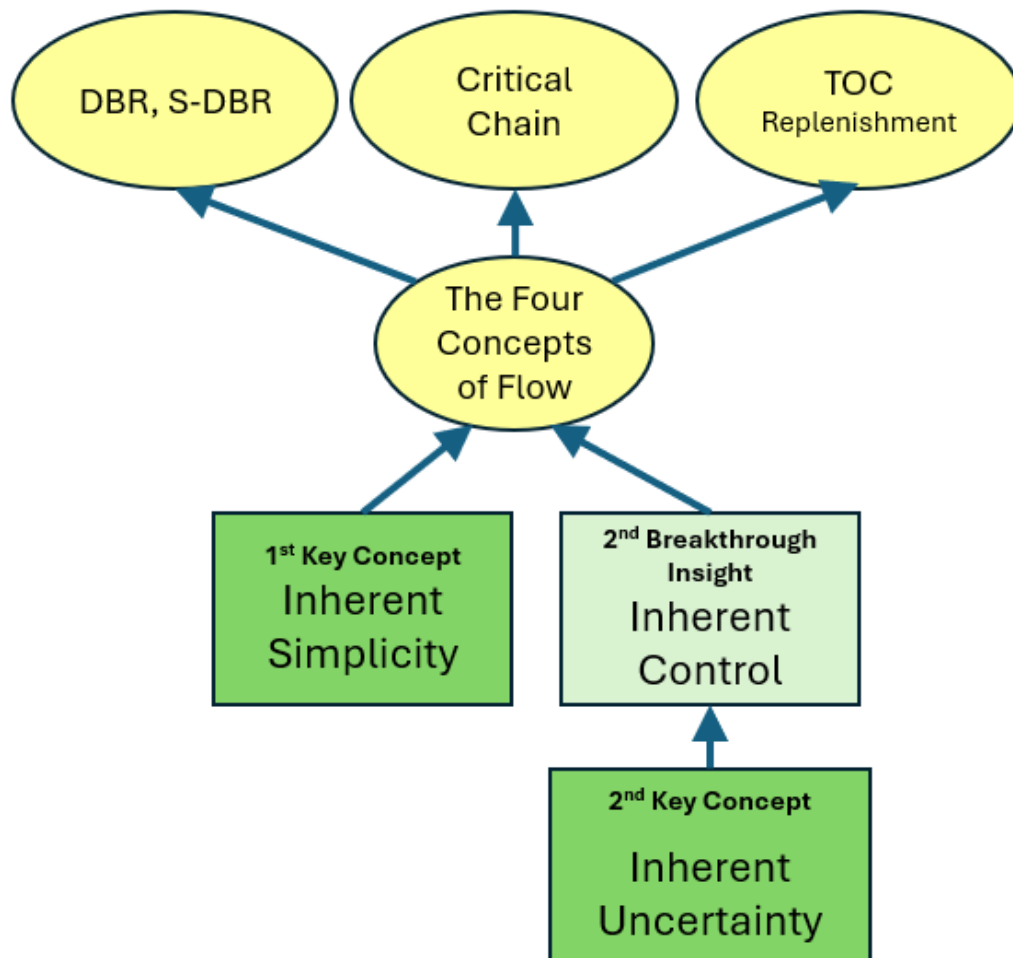
⁹ In order not to go into minute detail, the consumption of the buffers is divided into three equal parts: Green, Yellow and Red. Yellow, meaning the buffer has been consumed more than 33% and less than 67%, is more urgent than Green. Red, meaning the consumption is higher than 67% of the buffer can require special treatment, e.g. expediting.

Once we understand the faculty for control in our systems, there is a need to define the various types of controls required for different flow environments. Dr. Eli Goldratt described the guidelines for these controls in The Four Concepts of Flow¹⁰:

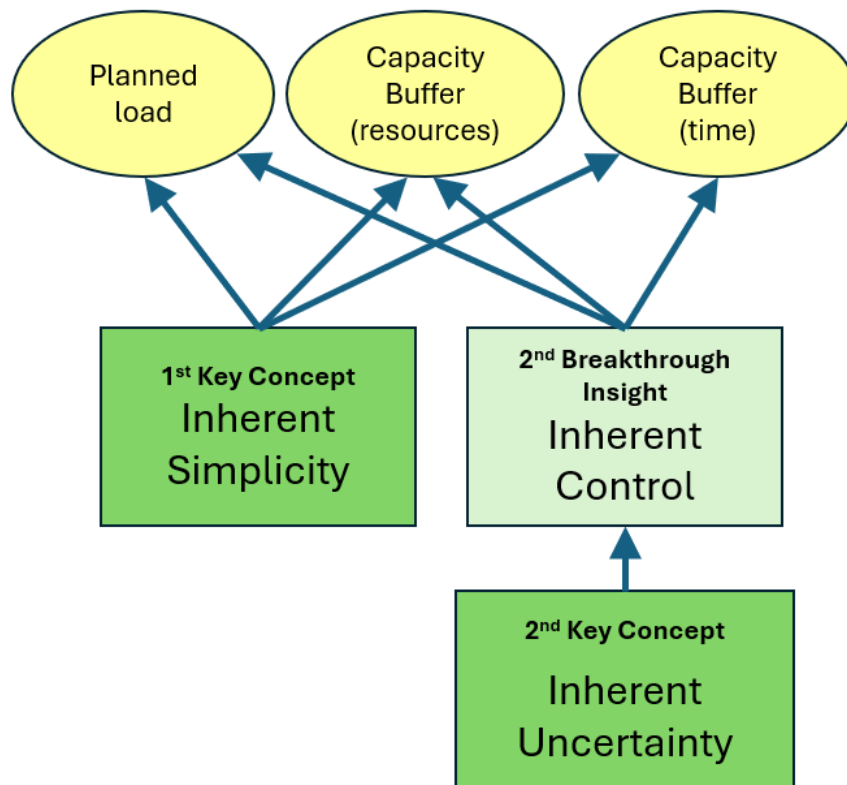


Applying the Four Concepts of Flow, the three main applications of TOC: DBR/S-DBR, Replenishment and CCPM were able to be created, impacted by the need to control statistical fluctuations, which are part of common and expected uncertainty. Within these applications, the use of visible buffers as part of planning is rooted in.

¹⁰ The Four Concepts of Flow: 1) Improving flow (or alternatively lead time) is a primary objective of operations 2) This primary objective should be translated into a practical mechanism that guides the operation when not to produce (prevents overproduction) 3) Local efficiencies must be abolished 4) A focusing process to balance flow must be in place. Standing on the Shoulders of Giants, Eliyahu M. Goldratt, 2008.
<http://www.tocico.org/page/StandingontheShouldersofGiants?&hhsearchterms=%22standing+and+shoulders%22>



The two key concepts and breakthrough insight are also the path to planned load in production, and capacity buffers in production (resources) and project management (time between drum utilization events).



Summary: **Inherent Control** – Effective priorities for meeting all our planning objectives can be generated from building on the foundation of Buffer Management. Closely monitoring the Planned Load of the weakest link provides management with warnings of possible chaos resulting from excessive demand, even before Buffer Management shows too many red orders.

3rd Key Concept

Inherent Consistency

Inherent Consistency¹¹ addresses the fear of conflicts.

Similarly, for mathematics and logic: to the extent that they are used in describing the universe and science, they cannot contain any contradictions. There is, however, a place where contradictions do occur: inside the human mind. We are all fraught with contradictions; we desire contradictory things; we believe contradictory ideas; and we predict contradictory events. – Noson S. Yanofsky, *The Outer Limits of Reason*

This statement above, drawn from Isaac Newton and others, is based on the Scientific Approach that strives to achieve perfect consistency. (You can substitute the word *conflicts* for Yanofsky's *contradictions* without changing the meaning).

This is a difficult task, even for science, where Quantum Theory includes cases where there are two seemingly conflicting ways to describe reality. The belief remains, however, that this is a misunderstanding, and in the future, all such inconsistencies will be rectified.

The abstract concept should still be used to solve practical conflicts. It can be tough, but these efforts can have a considerable impact, leading the way for challenging our hidden assumptions and coming up with innovative ideas that might generate a decisive competitive edge.

The conflict mentioned above, between improving sales through significantly more reliable delivery performance and reducing costs by achieving high resource utilization is a prime example. To resolve this, we must recognize that due to Inherent Uncertainty, fully utilizing all resources is unrealistic. Instead, focusing on the weakest link—the constraint—proves highly valuable.

Reliability can be achieved by having sufficient protective capacity at all non-constraint resources, planning appropriate visible buffers, and employing buffer management and

¹¹ Inherent Consistency (Harmony): There are no conflicts (or inconsistencies) in reality. Every conflict can be removed. One of Goldratt's original Four Pillars. Source of the term: TOCICO New Knowledge paper "The TOC Pillars" by Humberto R. Baptista, 2021

Planned Load. Thus, instead of having both minimally effective cost optimization and mediocre delivery performance, we can solve the seeming conflict ('evaporate the cloud' in TOC terminology), securing both reduced costs and much better delivery performance – well above that of the competition. This situation also allows for quoting higher prices and achieving higher net profit (NP).

Limitation: Having to compromise between two conflicting actions, where each action is needed to satisfy a necessary condition for achieving a desired common objective. By compromising we get significantly less value for the desired objective.

Flawed assumption: *We know and accept our perception of “reality.”* Every perception of reality is based on many (often hidden) assumptions. It is possible that challenging just one assumption and calling attention to a situation where that assumption is not valid opens the way to getting much more of the common objective.

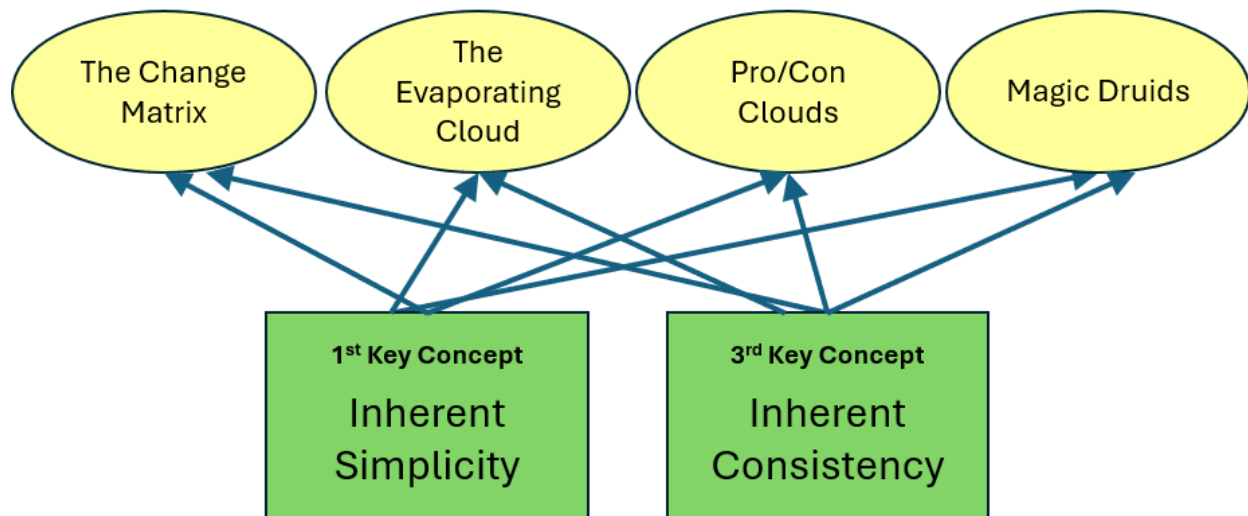
- The perception of a “conflict” should trigger us to reveal our assumptions and then look actively for a valid (realistic) way of challenging them.
- The generic insight of having no conflicts in reality should trigger us to check carefully all our assumptions, to create ways to solve, or ‘evaporate’ the conflict.

Another example of a conflict due to a flawed assumption

The seesaw conflict of holding less inventory to lower investment and carrying costs, versus holding more inventory to ensure availability to the system, with both being claimed to generate more value.

The flawed assumption ignores Inherent Uncertainty in achieving “optimal stock levels.” Once the variability in both demand and supply is fully recognized, a visible stock buffer logically becomes necessary – preventing the oscillating behavior of promoting more inventory and less inventory. It is also clear that it makes no sense to continually adjust the size of the stock buffer, as there is no way to be accurate. Only when there is a clear signal that the buffer is much too high or much too small should a change to the buffer be made.

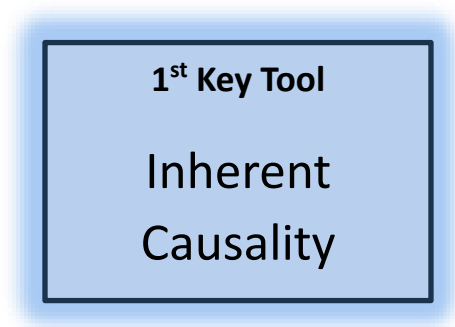
Inherent Simplicity and Inherent Consistency have been combined to create tools within the TOC community that enable conflict resolution.



Summary

Inherent Consistency (Harmony): There are no conflicts (or inconsistencies) in reality. All conflicts exist only in our minds. One or more invalid assumptions produce any perceived conflict (or inconsistency). *Every conflict can be removed.*

Two key tools



Inherent Causality¹² refers to cause-and-effect relationships within systems. Laying out a way to logically analyze the causes behind usually undesirable effects, as well as to predict future effects from actions, is a basic major tool of TOC. The more sophisticated tools, all based on the system's core capability, include identifying the core problem which is preventing much better success in achieving the Goal.

Limitation: Being unable, by using human intuition alone, to properly diagnose core problems, meaning that solving them would significantly enhance the performance of the entire system, and even when a good diagnosis has been made, finding the right effective solution, and being able to implement the solution.

Flawed assumption: Using logic is too cumbersome, subjective, and difficult to make it effective in finding answers. In fact, a few simple, learnable logical tools can greatly enhance analysis and provide answers to important questions.

Example of following the flawed assumption: Attempting to independently solve undesirable effects (symptoms) in the organization without considering root cause(s)

Keeping the goal of the system continually in mind, these are the key three questions that every manager should constantly ask.

¹² Inherent Causality: All systems, including human systems, are subject to cause-and-effect relationships. From this causality, we can trace back to core issues generating many undesirable effects. Likewise, we can map out an alternative future reality including, in advance, identification and mitigation of new problems generated by otherwise positive changes. Source of the term: the authors, 2024.

1. *What to change?* This means diagnosing what limits current performance. This is more than identifying the physical constraint. It is identifying the key flawed assumption that causes a core problem preventing any effective improvement.
2. *What to change to?* Or, coming up with an effective solution that would clearly improve performance.
3. *How to cause the change?* Creating an implementation plan that overcomes all likely obstacles, including people resisting the change.

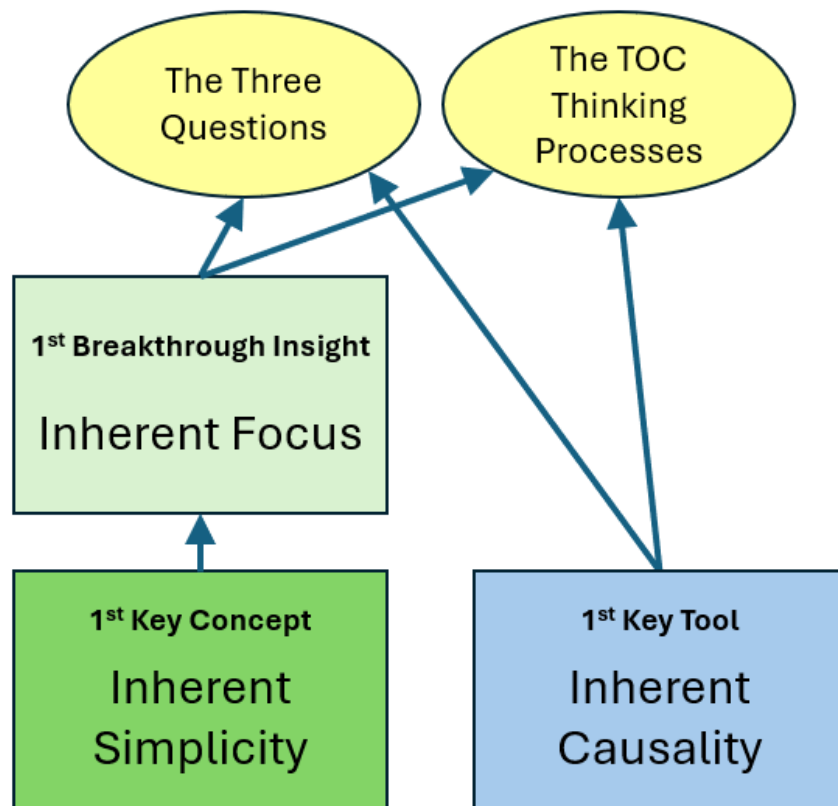
The Three Questions¹³ define the ongoing need of every manager to always look for significant improvements and be able to achieve them. Inherent Causality gives the manager a working tool to come up with the right practical answer. Answering these questions requires the use of careful logical analysis, without which might disrupt the good intentions of striving to improve the performance of the system. Without the Inherent Causality tools, answering the three questions based just on intuition could easily lead to a considerable failure.

Goldratt, along with others, made significant contributions to the field of Inherent Causality. One of these contributions is the Current Reality Tree (CRT), which describes a system's current state showing the root cause(s) leading to all the undesirable effects. Following the CRT, we have the Future Reality Tree (FRT), which maps out cause-and-effect relationships to achieve desirable effects in a system (while preventing new negative effects). Another tool is the Prerequisite Tree (PRT), which outlines how to overcome obstacles on the way to achieving an ambitious objective. There is also the Transition Tree (TrT) where the way to lay out detailed steps to an intermediate objective and/or convince somebody else of one's position/proposal is carefully outlined. The Transformational Strategy and Tactics tree is a powerful tool for presenting all the logic answering the three questions, including an effective way to implement the change.

Together with the previously noted Evaporating Cloud, these trees comprise what is now known as the TOC Thinking Processes.

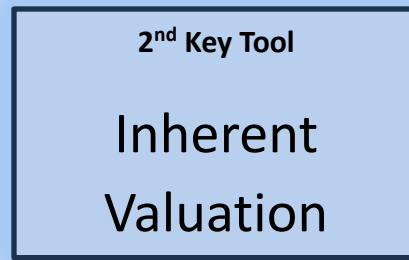
A special important related tool is the Categories of Legitimate Reservation. Eight rules define how to challenge a claimed causality. They are Clarity, Entity existence, Causality existence, Predicted effect existence, Additional cause, Effect Reversal (House on fire), Cause insufficiency, and Tautology. The objective is to focus the discussion on logical analysis: what exactly are we trying to challenge? It forces clarifying the logical arguments and provides a way to verbalize the claims convincingly. When someone is not convinced, he/she should make the effort to point to the relevant category of reservation and then verbalize the challenge.

¹³ Later expanded to Five Questions 1) Why Change? 2) What to Change? 3) What to Change to? 4) How to Cause the Change? And 5) How to Measure and Sustain the Change? Source: TOC Dictionary, Second Edition, 2012.



Summary

Inherent Causality: Systems are subject to cause-and-effect dynamics. To understand and manage a system, apply rigorous cause-and-effect logic, governed by the Categories of Legitimate Reservation, which allows effective criticism that is logical rather than emotional.



2nd Key Tool

Inherent Valuation

The second key tool of TOC is Inherent Valuation.¹⁴

There is a clear need to define the “goal units” of an organization. For a non-profit organization this can be quite a challenge. It can be done, but a lot of thought should be given about how to get a reliable measure. The condition for a ‘good enough’ answer is checking whether the goal unit can be reliably used to compare this year’s performance to the previous.

In what seems to be the simpler case, for commercial organizations, where the goal is making more money now and in the future, there are clear problems in finding the best product mix or deciding on taking or rejecting a market opportunity.

The key performance measurement for commercial organizations is net profit before tax (NP). The question of how to evaluate the impact of taxation rules might get different answers in different countries, so we won’t deal with that aspect here. While NP is a good enough measurement, the true challenge is looking for a measurement that can identify the real contribution of a proposed action to NP.

Limitation: It is very complicated to predict the financial impact on net profit for a suggested action. While the principle, *net profit equals revenues minus expenses* still holds, when it comes to evaluating a specific action or transaction there is huge confusion. Without a well-accepted, common-sense rationale (a simple enough procedure), managers might be afraid to rely just on their intuition.

A currently common tool to evaluate the impact of a sale on NP is having the financial department calculate the cost-per-unit of every product to be sold. The problem is that this process, while very simple to use, is *definitely wrong*, leading to a distorted idea of the true impact of a sale on NP.¹⁵

¹⁴ Inherent Valuation: Understanding the goal of the organization, its goal units, and the non-linearity of the cost of required capacity gives us the ability to measure the generation of value much more accurately. Source of the term: the authors, 2024.

¹⁵ Throughput Economics, p21, by Eli Schragenheim, Henry Camp, and Rocco Surace, Routledge/Productivity Press, 2019

Flawed assumption: Not distinguishing between linear and non-linear behavior.

While revenues behave mostly in a linear way, as do the cost of materials, the cost of the required capacity of various resources usually does not.

Making the distinction between linear and non-linear, while keeping sight of overall financial performance is the essence of Throughput Accounting. The term Throughput (T), defined for commercial organizations is the periodic summation of revenues minus truly variable costs – which includes the cost of materials plus, possibly, commissions and other expenses that vary with every unit sold. Two other financial measurements are Operating Expenses (OE) and Investment (I). Both express the money required to sustain the business. However, the prime measurement for management to focus on is T per period, which expresses the added value generated by the organization for that period.

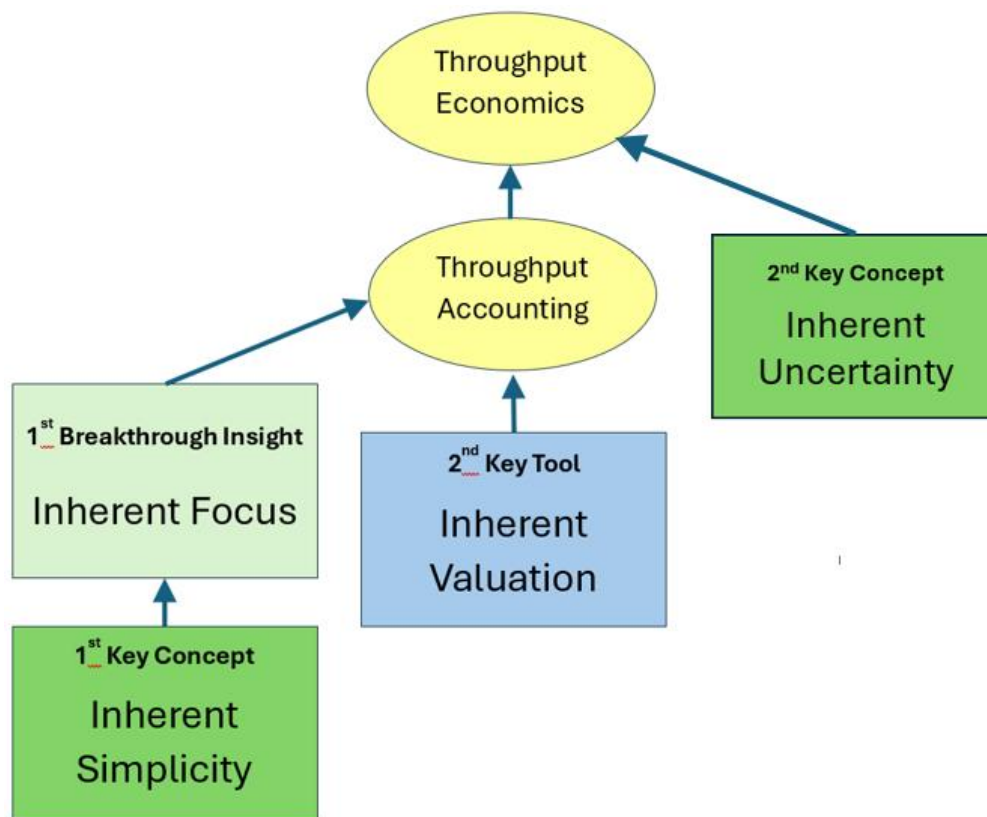
Subtracting truly variable costs from revenues (resulting in Throughput) and considering the non-truly variable expenses as Operating Expenses allows us to make decisions that will increase net profit.

Example: When an airline gives a free ticket to a frequent flyer (after ensuring there are unsold seats on the flight), what is the actual cost to the airline? The simple answer: no extra cost on top of the regular cost of the flight. One could argue that extra passengers would minimally increase fuel consumed and add a small allotment of snacks and beverages. However, this extra cost is so low that for practical purposes it can be considered zero.

Throughput Accounting is a special TOC application that challenges cost accounting practices, including those of Activity-Based-Costing.

Throughput Economics is a new application, stemming from Throughput Accounting to be used for a higher level of decisions, which also considers Inherent Uncertainty.

Operations, Project, and Replenishment Planning have been grossly negatively impacted by cost accounting's flawed assumptions. All have been now updated according to Throughput Accounting's new understanding.



Summary

Inherent Valuation: *There are two critical questions concerning inherent value:*

1. *How should we evaluate how much the organization has achieved of its Goal? In other words, what are the key performance measurements of generated value for the organization?*
2. *How can the organization significantly increase its perception of value to the market?*

The basic conclusions from Inherent Valuation provide performance measurements. We can apply this understanding to using innovation to significantly increase perceived value. (see Inherent Value from Innovation below).

1st Beneficial Belief

Inherent Potential

Inherent Potential¹⁶, named originally by Eli Goldratt as “Never Say I Know,” covers even more than the already huge insight that there is no limit to our potential, as we can always achieve much more. “Never Say I Know” is a great instruction to open our eyes to what *we know we don’t know*. Inherent Uncertainty already helps us recognize what we don’t know. Let’s focus here on extending our efforts beyond our comfort zone, where we (wrongly) feel “We Know,” and put efforts forth to see the huge potential ahead.

Limitation: Success leads, many times, to recency bias and inertia that limit searching for more opportunities.

Success is a great example of how good things could become also a limitation, causing negative consequences, which we should be careful of.

Flawed assumption: *“I’ve made great improvements and am successful enough – there’s no need for more, and there is no secure way to achieve more.”*

Handled properly, the opportunity is huge and can be achieved safely. There are ways to check the risk, significantly reduce it, and then add buffers to reduce the probable damage even more.

The flawed assumption causes the inertia that is nicely described as *“if all you have is a hammer, everything looks like a nail.”*

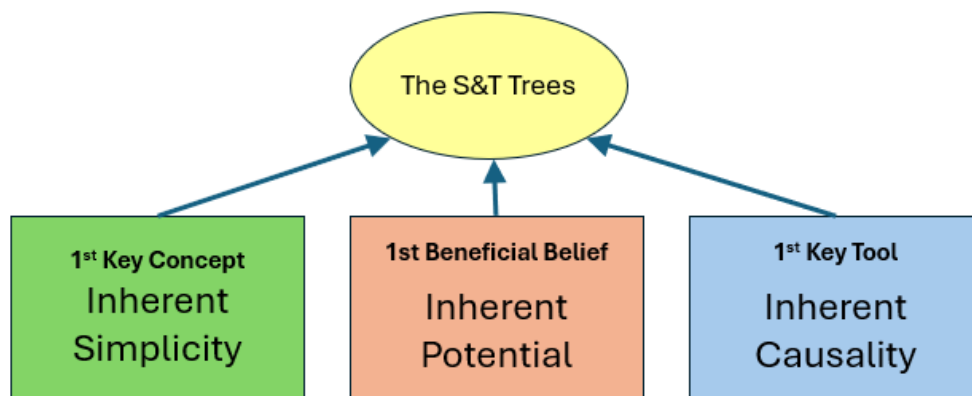
While a very big part of TOC deals with improving flow to customers, this belief looks deeply into how to increase value, and the perceived value, to current customers, or to actively look to deliver value to new customers.

¹⁶ Inherent Potential: Every system, no matter how successful, can be significantly improved. Even the sky is not the limit. The higher the base, the higher the jump. Never say, “I know.” One of Goldratt’s original Four Pillars. Source of the term: TOCICO New Knowledge paper “The TOC Pillars” by Humberto R. Baptista, 2021

Examples of following the flawed assumptions

- 1) Thinking that since you are better than you used to be, there is no need to continue improving.
- 2) Thinking that there are no new, big ways to generate more value without taking a considerable risk that endangers current achievements.
- 3) Assuming, without careful examination, that a new opportunity will respond to the solution applied to the last opportunity.

Inherent Potential releases us to visualize what may be possible within our system or organizations. When we combine Inherent Potential with Inherent Simplicity and Inherent Causality, we can create tools to construct a detailed roadmap of the best set of strategies and tactics required to realize the potential of the system, considering also the Inherent Uncertainty to overcome the risks.



Success makes us believe we have reached the maximum, and all we need now is to keep what we have achieved so far. This tendency is invoked by the fear of taking big risks, which could wipe out historic achievements.

Risks can be dealt with, there are ways to reduce them. Recognizing that you can never know should make you both challenge your assumption while looking ahead for so much more, with very limited risk.

Summary

Inherent Potential: You can always achieve so much more. “Never Say I Know.”

3rd Breakthrough Insight

Inherent Value from Innovation

Our final breakthrough insight is Inherent Value from Innovation.¹⁷

To create more value, a necessary condition is to come up with an innovative idea. However, not every innovation generates value. So, we have to clearly identify which innovations have the potential to create value, and also what has to be in place to achieve it.

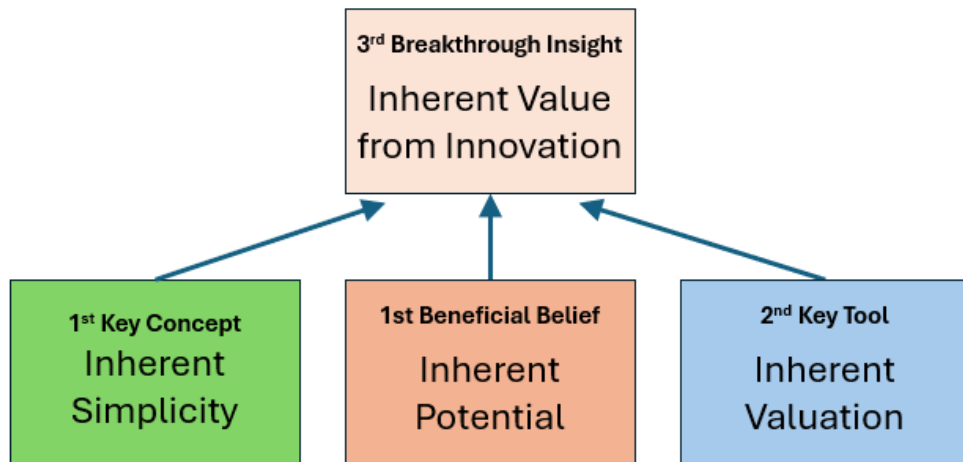
Limitation: Feeling safe within our comfort zone.

Flawed assumptions

- 1. The risk of any innovative idea is always very high.**
- 2. The only way to reduce the risk of innovation is to invest in many independent innovative ideas e.g. in a Risk Fund, and it'll still be a high-risk endeavor.**

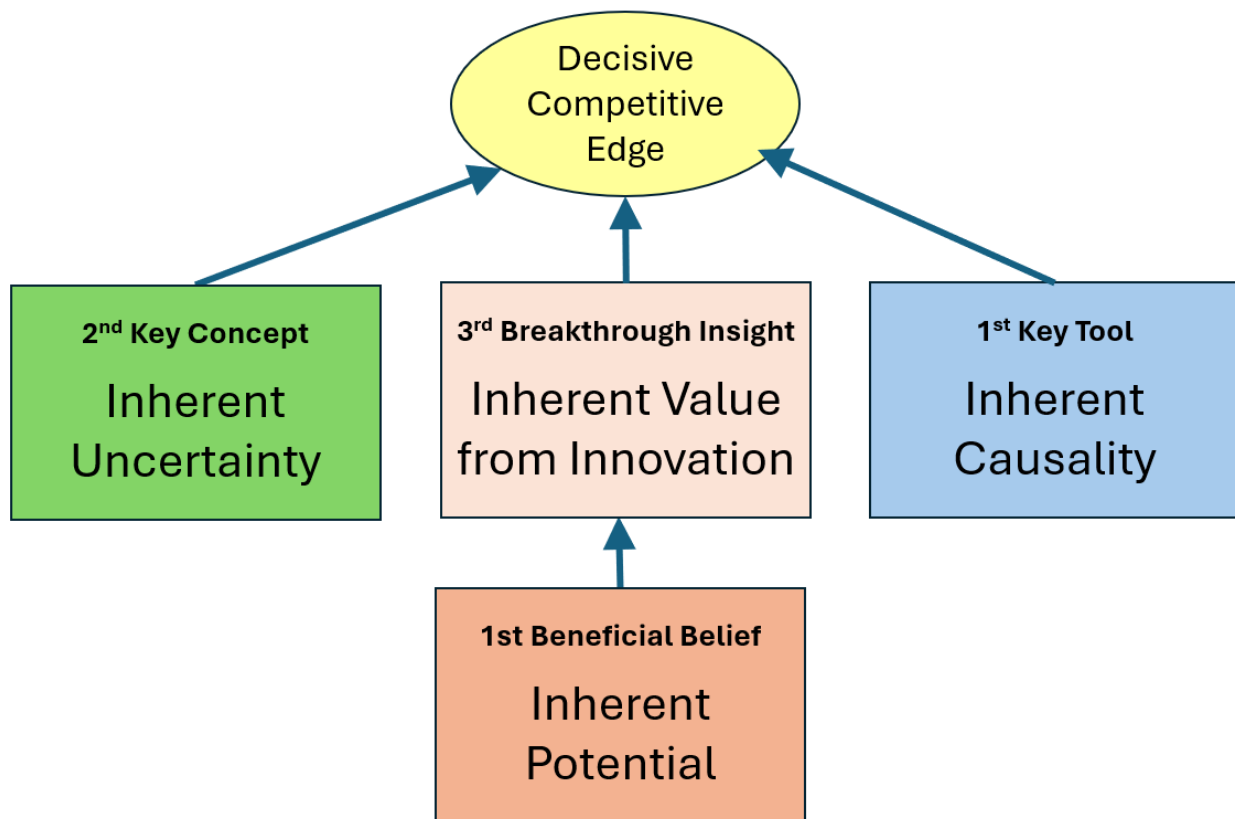
Innovation fits high-risk start-ups and is financed by risk funds which understand how to evaluate innovation and protect their investment by spreading their funds over many such start-ups.

¹⁷ Inherent Value from Innovation: Every innovation means overcoming a limitation. But not every limitation truly blocks achieving something of value. Thus, it is important to examine what is the generated value from any innovation. Source of the term: the authors, 2024.



Market-leading companies can map their forward-looking strategies and tactics by utilizing their current competitive edge. But companies that don't have this advantage need more. They need innovative ideas and the right kind of thinking to move in their markets, and even leapfrog the current market leaders.

To come up with a market-changing action while finding ways to reduce risk in innovation, several TOC insights are used. The combination of Inherent Value from Innovation with Inherent Uncertainty and Inherent Causality is behind the conceptual objective of gaining a Decisive Competitive Edge (DCE), adding it to their detailed effective Strategic plan (e.g. their S&T tree).



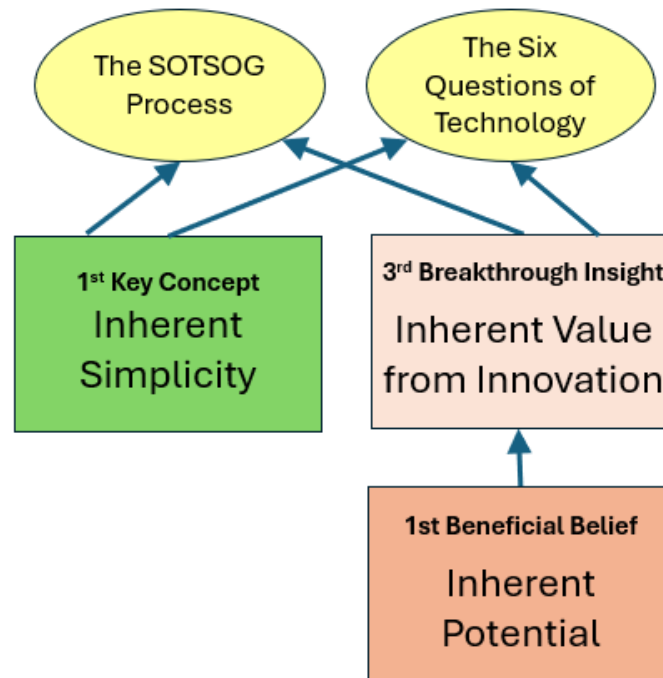
At the heart of reducing the risk of any innovation lie several insights that comprise the Six Questions of Technology to assess the value of a new technology. It is relatively easy to translate “new technology” into *innovation*.

Here are the bare new insights on how to check the true value of a suggested innovation:

- a. Gaining an understanding of the current pains, being unable to get the desired value for potential customers within a market segment
- b. Identifying the limitation that prevents users from gaining additional significant value
- c. Eliminating, or vastly reducing the limitation
- d. Being able to lead potential clients to both perceive the new value and know how to fully bring it forth for that market segment
- e. Establishing a new decisive competitive edge by creating the required operational and marketing strategy to fully exploit the new generated value

Another tool for reducing the risk of innovation comes from the steps in *Standing on the Shoulders of Giants* (SOSOG), a paper by Eli Goldratt that outlines how to effectively use great

ideas and insights which were developed by giants, meaning they are powerful, and then find how the essence of the Giant's ideas could be used to pave the way to more value.



Summary

Inherent Value from Innovation leads the way to recognize the next step that will dramatically elevate the performance of the system.

2nd Beneficial Belief

Inherent Goodness

Inherent Goodness¹⁸ makes the claim that *People are Good*. This is a somewhat “strange” belief. What does it mean people are good? Were the Nazis in Germany good? It is important to understand that this is not a moral statement, but rather a claim that in organizations, the vast majority of people want to do a good job and be seen as reliable, responsible members of the team.

The key idea is shying away from the easy and distorted habit of blaming. People do not basically wish to do evil and don’t enjoy doing bad things to others. People are educated with certain values and beliefs; the circumstances of their life have an impact on their behaviors. And a huge, often overlooked aspect of behavior is the measurement system of the organization. People’s behaviors may be directly associated with the measurements that lead to bonuses, promotions, etc., even if those measurements are misguided.

It is absolutely not effective to blame others, certainly before fully understanding their interests and values. Once understanding is achieved, it can be possible to reach win-win agreements.

Limitation: Failing to achieve a desired objective due to the contradictory behavior of other people, which wasn’t anticipated and is not understood.

Flawed assumptions:

1. ***When people take actions against our interests, it is usually because they are idiots, have something to gain personally from it, or even enjoy hurting us.*** Thus, we cannot find the right way to convince them to behave in a way that would contribute to what we want to achieve.

¹⁸ People are good. Assigning blame is ineffectual. Similar in application to Stephen Covey’s “Seek first to understand, then to be understood.” One of Goldratt’s original Four Pillars. Source of the term: TOCICO New Knowledge paper “The TOC Pillars” by Humberto R. Baptista, 2021

2. We cannot really understand what other people truly think

The third key concept, Inherent Consistency, deals with resolving conflicts, and also highlights the case where other people act to achieve something that clashes with what we are trying to achieve. That key concept, together with this key belief that people are good, and whatever they do it is not just intended to make us miserable, should trigger us to understand others.

From a business perspective, there is special importance to understand our clients, the clients of our clients, our suppliers, and our employees. The Thinking Process tools can be useful to analyze not just our own reality, but also to explain the behavior of other people and organizations.

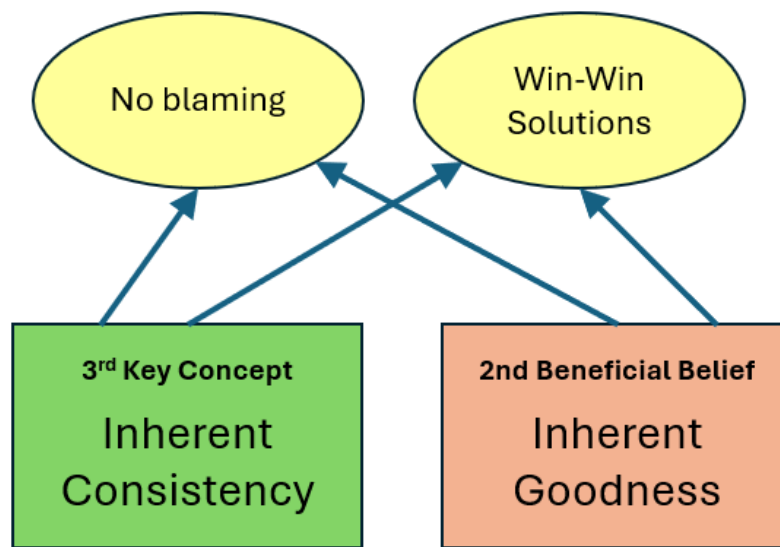
It is difficult to use cause-and-effect logical tools alone to describe the motivation of another person or organization. First, the goal/top objective of the other person or organization has to be clarified. We should also outline our own assumptions, and understand the impact of the emotions of the other party.

Raising assumptions about the effects the other party is facing is critical, but we also need to treat them as hypotheses, looking for evidence that our assumptions are valid.

It should be possible however, based on some known effects and generic assumptions about human behavior, to reduce the overall impression of complexity. In other words, there are a few critical variables that should be considered, including practical gain, ego, and fear.

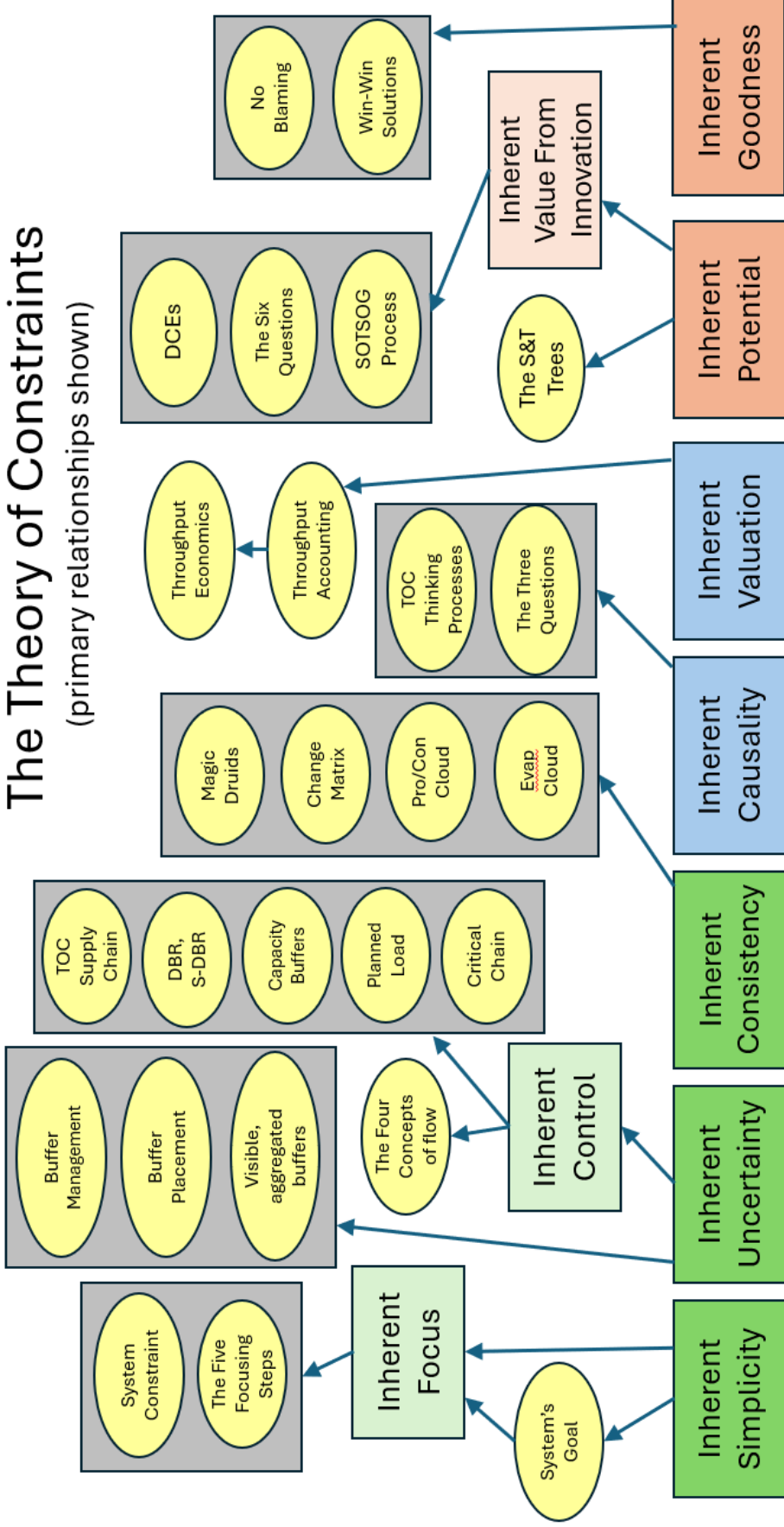
It is easy, and very tempting, to blame others. However, blaming others doesn't help fix a negative situation. Understanding the reasons behind peoples' behavior, and especially the assumptions behind it, as well as the circumstances that generated the reasons, will vastly help us to find our way to create win-win solutions.

People are good is a belief, meaning we are not able to prove it. Even if there is doubt about whether the belief is always true, it seems to be very constructive to assume it is true, which pushes us to analyze how it can be explained why X took this action that harms us. Identifying the causes would give us a considerable advantage in converting the negative situation into a very positive one.



Summary

Inherent Goodness: People are good. The reasons for negative outcomes of man-made events in our systems do not result from people's nature (good or bad) but from their assumptions, measurements and circumstances.

[illegible]

Selected references on the applications of TOC shown in this document:

System Goal; System Constraint; The Five Focusing Steps *The Goal: A Process of Ongoing Improvement*, 30th Anniversary Edition, by Eliyahu M. Goldratt and Jeff Cox, North River Press

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Magic Druids *Magic Druids*, by James Powell and Peter Cronin, <https://www.tocico.org/page/TOCBodyofKnowledgeMagicDruids>

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