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# The TOC Pillars – a Whitepaper

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## Introduction

Eli Goldratt wrote in the introduction to the first edition of *The Goal*<sup>i</sup>:

*“Finally, and most importantly, I wanted to show that we can all be outstanding scientists. The secret of being a good scientist lies not in our brain power. We have enough. We simply have to look at reality and think logically and precisely about what we see. The key ingredient is to have the courage to face inconsistencies between what we see and deduce and the way things are done.”*

And in the third edition<sup>ii</sup>

*“The Goal is about science and education [...] science is simply the method we use to try and postulate a minimum set of assumptions that can explain, through a straightforward logical derivation, the existence of many phenomena of nature. [...] This book is an attempt to show that we can postulate a very small number of assumptions and utilize them to explain a very large spectrum of industrial phenomena.”*

With these and the name *Theory of Constraints*, it is clear that TOC was created to be a Science aimed at explaining and consequently managing human organizations.

It is then more than reasonable to ask: what are the basic assumptions of TOC? Nicknamed “The Pillars,” these are the basic building blocks that enable understanding how organizations function and how to improve their performance in a practical and logical way.

The Pillars are not etched in stone, were not developed all at once, and not worded as they are now. This dynamic nature is a characteristic of any living science, the ongoing process of expanding knowledge either by introducing new assumptions or replacing old ones with more general and far-reaching ones.

This whitepaper will present the five Pillars of TOC in the form that Eli Goldratt explained them. Other authors have explored these concepts. Some of the most relevant are listed at the end of this paper.

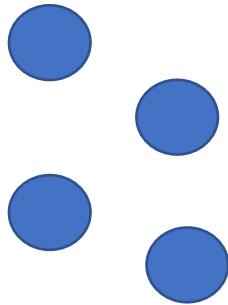
## Inherent Simplicity

In the series of videos *Necessary and Sufficient*<sup>iii</sup> - Section 2, “The Basic Assumptions of TOC,” Eli Goldratt states that “TOC is nothing but the extension of Physics, or for that matter all the hard

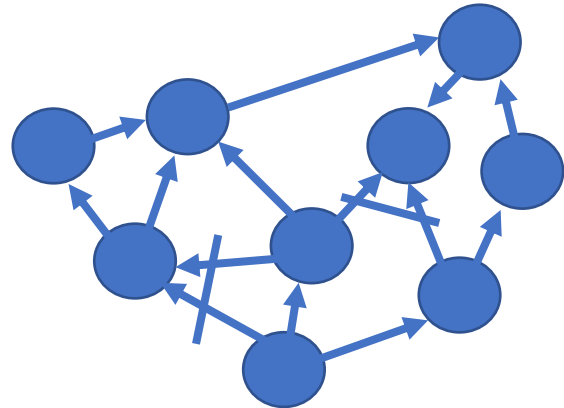
sciences.” And he proceeds to highlight that the approach of the hard sciences is based on few beliefs, which are usually associated with specific (and sometimes unusual) definitions of common terms. The first one is “complexity.” The usual (or social sciences) definition of “complexity” is very different from the hard sciences (and the TOC) meaning. This difference creates many important consequences.

To understand the differences, and their effects, let’s consider two systems:

**System A**



**System B**



Here the different definitions of complexity are opposed: in the social sciences definition, System B is more complex than A, while in the hard sciences System A is more complex than B.

Let’s compare the different definitions of “Complexity”:

- Social Sciences  
“The more data needed to fully describe a system, the more complex it is.”
- Hard Sciences  
“The more degrees of freedom a system has, the more complex it is.”

Degrees of freedom refers to how many points must be affected to impact the whole system.

System A is more complex with the hard sciences definition because all points (circles) must be affected to impact the whole system, while in System B, affecting only the bottom point generates ramifications and impacts the entire system (through the cause-and-effect relationships illustrated as arrows).

The hard science’s definition leads to the fundamental belief: “There are no complex systems in reality.”

As we increase our understanding of real systems, we discover more cause-and-effects relationships among their parts. And the more connections a system has, the fewer points we need to affect to impact the whole system. In other words, real systems are highly interconnected and have few degrees of freedom.

The Social Sciences view leads people to think that to improve an organization, one must improve every part of it. Still, the fact that all parts are interconnected with cause-and-effect relationships means that if you try to improve one aspect without addressing its cause, the results will be minimal.

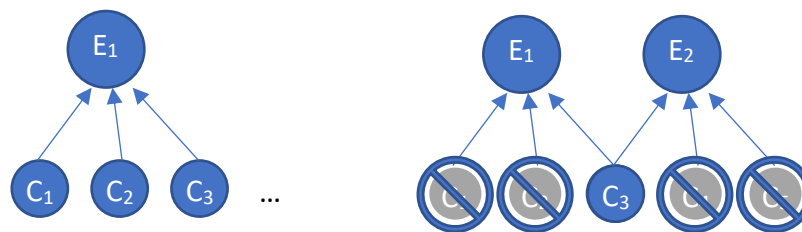
So, the first Pillar of TOC is:

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*Inherent Simplicity: systems (for instance, organizations) are inherently simple, despite their apparent complexity. In other words: a few or even one point (Constraint) controls the performance of the whole system, and a few or even one cause (Core Problem) generates the vast majority of the problems.*

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In the book “The Choice,” Goldratt highlights the fact that one effect can have many causes, but as we consider more and more effects in one system, the number of causes drops dramatically:



Only common causes to all effects remain. Causes of one effect that aren't causes to others are eliminated in this process. And this also indicates that the more effects we consider in one system, the fewer causes will explain all of them. In other words, there is *Inherent Simplicity* in deriving the causes of multiple effects.

### Inherent Consistency

Also, in *Necessary and Sufficient*, Section 2, Goldratt defines a “Problem” as a conflict that prevents a system from achieving its objectives. And presents the second fundamental belief: “There are no conflicts in reality.” Here the word conflict is a synonym with inconsistency (or contradiction). Goldratt also states that “no physicist will compromise” when presented with a conflict/inconsistency.

The conclusion of the hard sciences (and therefore TOC), when confronted with an inconsistency, is that there must be a mistake somewhere. Since “there are no conflicts in reality,” we must conclude that we, humans, made a mistake.

An example is two methods of weighing an object. If the two produce very different results, scientists will conclude immediately that one or even both are wrong. Or it may be even that

our concept (or understanding) of weight is wrong. Never a scientist would say “let’s compromise” and average the two results, for instance.

We come to a paradox: if there are no conflicts in reality and conflicts prevent systems from achieving their objectives, how come we see tremendous struggles in human organizations trying to achieve their objectives? This comes from the fact that the only place where conflicts can exist is our minds, a place outside the physical reality. And if we try to use these thoughts of conflicts to describe reality, we will unavoidably miss essential aspects. Why do we think there are conflicts if there is no evidence of it? Because we hold invalid assumptions, preconceived ideas that create inconsistencies in our interpretation of reality.

The natural conclusion is that each perceived conflict must come from an invalid assumption(s). So, we come to the second pillar:

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

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### Inherent Goodness

We can see in many places Eli Goldratt stating that even though someone may present an obstacle to a significant improvement, this is not because “they are stupid.” He lays out the logic behind people’s actions and behaviors that lead to the resistance to change. In the Satellite Program (later renamed to the Self Learning Program or SLP), section 7<sup>iv</sup> deals with People Management. And here, he introduces one of the most misunderstood Pillars of TOC.

Right at the beginning of this section, he proposes one word to summarize what people know about managing people: Respect. And from there, he proceeds to uncover the conflicts that make it so hard to give and receive respect. It is clear that to give respect requires work. It is implied that we need to understand people’s assumptions and motivations to respect, which is the basis for the third pillar.

During the years that followed, Eli Goldratt and many colleagues revisited this concept, and the synthesis came in the book *The Choice*<sup>v</sup>: he states that the third pillar comes from a bad habit: when something goes wrong, there is a strong tendency to blame people. And when we do so, our capacity to understand plummets and relationships deteriorate.

In chapter 16, Efrat Goldratt goes: “How can I seriously entertain the opinion that people are good?[...] On the other hand, Father’s approach is pragmatic, and it does work. [...] If I want to improve my chances of living a full life, I’d better learn how to think clearly. And to do that, I must overcome the obstacle of my tendency to seek refuge in blaming others; raising derogatory explanations.”

This pillar's crucial point is to recognize that Goldratt is not talking about people's nature when he states: "People are good." The affirmation is a working assumption, in other words, a mental stance that steers our thinking away from blaming and towards assumptions and circumstances.

So, the third pillar is:

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*Inherent Goodness: People are good. The reasons for anything that goes wrong do not come from people's nature (good or bad) but from their assumptions and circumstances.*

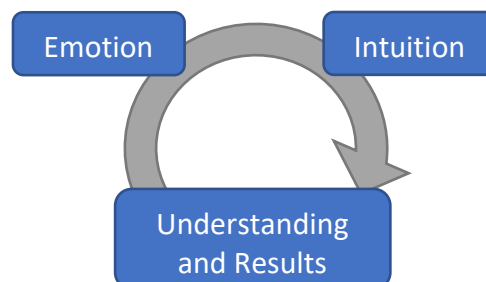
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### Change/Improvement

Also, very present in Goldratt's thinking is that there is no practical limit for improvements. That any situation can be substantially improved. In "The Choice," he comes back to this notion, and in the Keynote address he prepared for the 2011 Conference<sup>vi</sup>, he clearly states the fourth pillar: "Never Say I Know." And the associated process is called "Standing on The Shoulders of Giants."

What is meant by this statement? There are two fundamental lines of thought behind it: the first is the interplay between emotion intuition and logic, the second is behind the structure of cause and effect.

Goldratt explains to Efrat in Chapter 18 of "The Choice" that his logical view of the world is not cold, and this is not just a vain attempt of sugar-coating how logic applies to rational and irrational behavior. He points out that when people care about a subject area, they have strong feelings about it. With the energy from this feeling, there is the possibility to develop more and more intuition about the area. And eventually, the intuition coalesces into new understanding and new results, which is a powerful emotional moment. So, the loop goes:



And he points out that thinking clearly is an excellent accelerator of the connection between "Intuition" and "Understanding and Results." Looking at this loop, we can see that it is like a helix propelling people and results upwards. That is why we should "Never say I know": if we

for one moment believe we know something entirely, the cycle is broken, and we'll be prey to a self-fulfilling prophecy.

The second part comes from the subtitle Goldratt chose for this pillar: "The more solid the base, the higher the jump." It comes from the structure of cause and effect: as we face inconsistencies and expose invalid assumptions (Inherent Harmony pillar), we reveal deeper causes. And deeper causes cover many more effects than the shallower ones. This means we gain more knowledge and influence over a broader field. And with that, we conclude that by seeking deeper causes, we'll have enormous jumps in the knowledge. When we read the subtitle, we notice Goldratt mentioning, "The more solid the base," which is a clear indication of the cause and effect thinking and how we can rely on it (via Inherent Harmony) to grow and cover more and more.

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*Inherent Potential: Never say "I Know." The more solid the base, the higher the jump. Any situation can be substantially improved. Thinking otherwise will almost guarantee it won't.*

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## Variability & Uncertainty

The book "The Choice" covers what is needed for an individual to live a full life. It is not covering what is necessary for an organization to be successful in the long run. Goldratt was writing another book that was supposed to be his last when he passed away in 2011. This book was titled "The Science of Management," and Goldratt published its introduction in a video<sup>vii</sup> where he reads the introduction and includes more explanations on the principles (pillars) of TOC.

In this work, he revisits the Complexity (countered by Inherent Simplicity), Conflicts (countered by Inherent Harmony), and he verbalizes another crucial problem: The fear of Unknown. And with it outlines another TOC pillar.

The problem is that people, especially in organizations, when faced with unknowns and variability, usually respond by diving down into more details and increasing the resolution of the control mechanisms. For instance: problems in managing the budget can lead to a more detailed account structure and more control points in tracking movements, unknowns in delivering projects in time, scope, quality, and cost can lead to more detailed plans, and so forth.

The detailing makes people more likely to react to small oscillations that are in the vast majority innocuous and intrinsic to the organization's everyday life. The energy, time, and effort dedicated to pursuing small fluctuations drain essential resources from managing and improving more significant areas and movements in the organization, leading to diminished performance and people working harder.



As we can see in the logic above, the effects are quite devastating. And the efforts spent are often confused with productive work.

The pillar outlined by Goldratt here is the basis for TOC buffers and their respective buffer management.

Since Goldratt did not coin a specific term for this pillar, we must read between the lines and pick one. The desired effect of the pillar is to allow people to know when they should act upon fluctuations (act on the “signal”) and when to do nothing (tolerate the “noise”). Another effect is to allow for plans to be followed under the majority of normal oscillations present in the system (using buffers to protect the commitments). As we can notice, the usual response is to act, and the pillar is to remind and guide us when not to do so. Therefore:

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***Inherent Tolerance:** Don’t optimize within the noise. All human-based organizations have fluctuations. Reacting to all regular fluctuations ends up amplifying variability. Planning and execution must explicitly account for them with simple mechanisms to withstand regular fluctuations (without any further actions) and react to extraordinary ones.*

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## Other Sources

Other sources illustrate important concepts related (or included) in the five pillars above:

- **Pareto Principle:** coined by Vilfredo Pareto<sup>viii</sup>, also known as the 20:80 principle. States that few causes (the “20%”) are producing the majority (the “80%”) of the effects. Works in a wide range of fields and phenomena. Requires the studied phenomena to be independent.
- **Isaac Newton:** specifically, the quote<sup>ix</sup> “Natura valde simplex est et sibi consona” (Nature is very simple and harmonious with itself). This quote introduces the first two pillars of TOC and the hard sciences: Inherent Simplicity = Nature is very simple, and Inherent Harmony = harmonious with itself.
- **Funnel Experiment:** devised by W. E. Deming the experiment illustrates what happens when we react to “noise.” The name given by Deming to such reactions is “Tampering” or, even better: “worsening” the system.
- **Scientific Claim:** Goldratt explicitly adopts Karl Popper’s definition of science<sup>x</sup>: any claim that can be proven false (falsifiable) is a scientific claim. And he is prudent when



checking abstract causes (checking if they and their effects are testable and falsifiable). See more in *The Choice*, p 126.

- **Herbert Alexander Simon:** Nobel prize in Economics for his model of the human mind: Bounded Rationality. According to Simon, human mental faculties are limited (sensory, memory, and cognitive wise), and this implies that our decision making is not well described by “picking the optimum alternative after examining all possibilities,” but rather by “picking a good enough alternative (that improves the decision maker’s situation) by examining a sample of all possible alternatives.” This was called “satisficing” and is a more accurate model to predict human behavior.
- **The TOC Pillars Webinar:** conducted<sup>xi</sup> in March 2018 by Humberto R. Baptista, explores in more detail the evolution, definitions, and consequences of the five pillars.

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<sup>i</sup> Goldratt, E. M., & Cox, J. (1984). *The Goal: A Process of Ongoing Improvement* (2nd ed.). North River Press.

<sup>ii</sup> Goldratt, E. M., & Cox, J. (2004). *The Goal: A Process of Ongoing Improvement* (3rd ed.). North River Press

<sup>iii</sup> Goldratt, E. M. (2000-2002). *Necessary and Sufficient*, Goldratt Marketing Group

<sup>iv</sup> Goldratt, E. M. (1999). *The Satellite Program*, TOC Marketing Group

<sup>v</sup> Goldratt, E. M. & Goldratt-Ashlag, E. (2010). *The Choice, revised edition*, North River Press

<sup>vi</sup> Goldratt, E. M., Scheinkopf, L. (presenter) (2011). *TOCICO 2011 International Conference Keynote*, TOCICO

<sup>vii</sup> Goldratt, E. M. (1999). *Introduction to The Science of Management*, <https://app.toc.tv/player/543>, accessed on 01/Feb/2021. Also, with comments on: <https://www.linkedin.com/pulse/science-management-introduction-commentary-humberto-baptista/>

<sup>viii</sup> Vilfredo Pareto, Wikipedia entry, [https://en.wikipedia.org/wiki/Vilfredo\\_Pareto](https://en.wikipedia.org/wiki/Vilfredo_Pareto) accessed on 01/Feb/2021

<sup>ix</sup> Originally from an alternate conclusion to *Principia Mathematica*, can be seen in context in: Hall, A.R. & Hall, M.B. eds (1962). *A Selection from the Portsmouth Collection in the University Library, Cambridge*, p. 321, Cambridge University Press

<sup>x</sup> Popper, K (1959). *The Logic of Scientific Discovery*, Abingdon-on-Thames: Routledge

<sup>xi</sup> Baptista, H.R. (2018). *The TOC Pillars*, TOCICO. Webinar: <https://www.tocico.org/page/SpringWEBINARHumbert> accessed in 01/Feb/2021