THEORY OF CONSTRAINTS
INTERNATIONAL CERTIFICATION ORGANIZATION

THE TOCICO DICTIONARY

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As appropriate, you would fill-in the correct page (that is, "xx") for the specific definition being referenced.

Acknowledgement: The editors wish to recognize the following persons who have made significant contributions to this volume: James Cox, PhD; Lisa Ferguson, PhD; and James Holt, PhD.

4-by-4 – A workshop consisting of two 4 day blocks: the first 4 days provide education on the TOC paradigm and the interdependence of the appropriate functional areas (operations, finance and measurements, project management/engineering, distribution/supply chain, marketing, sales, managing people, and/or strategy); the second 4 days are devoted to identifying the core problem of the organization and the customized solution (including the appropriate functional area solutions) and implementation roadmap (of injections and IO's).

See: core problem, TOC paradigm.

A-plant – A production environment that begins with a relatively large number of raw materials that pass through a succession of converging operations which create subassemblies, assemblies, and, finally, a relatively small number of end items. The letter A is used to represent the logical network of material flow, which has no relationship to the physical plant layout, because it is wide at the bottom (many raw materials), and converges at the top (few end products).

Examples: The manufacture of helicopters, kitchen cabinets, and footwear.

See: VATI analysis, convergent point.

activation – Putting a resource to work.

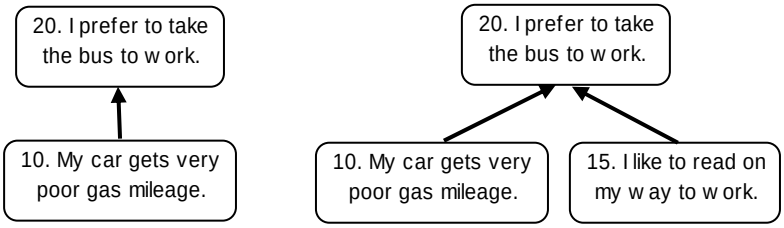
Usage: TOC claims that just because a resource is activated does not mean it is being utilized productively to achieve more of the goal. If the work being done is in excess of what is needed to fully exploit the constraint or properly subordinate to it, then the result will be excess work in process inventory (WIP) and/or excess finished goods.

Perspective: In traditional management, non-constraints are frequently activated to levels above what is needed to exploit the constraint.

See: constraint, exploit, subordinate.

additional cause reservation – A Level III reservation in the categories of legitimate reservation that is used by a person scrutinizing a sufficiency-based logic diagram to question whether the stated cause(s) is/are sufficient to fully account for the stated effect. A justifiable additional cause will have a significant impact on the stated effect.

Example: As shown in the first diagram, "If, 10. My car gets very poor gas mileage, then, 20. I prefer to take the bus to work." A scrutinizer may use the additional cause reservation to suggest that, "15. I like to read on my way to work," could also be a legitimate cause of preferring to take the bus. The second diagram is verbalized as follows: If "10. My car gets very poor gas mileage, or, if 15. I like to read on my way to work, then, 20. I prefer to take the bus to work."



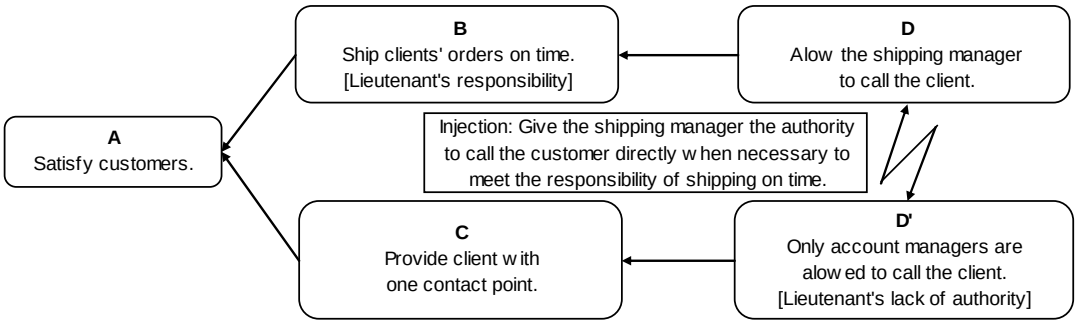
Perspective: A legitimate additional cause will tighten the logic underlying the observed effect and more fully explain its magnitude. Neither cause by itself can fully account for the magnitude or extent of the effect. A scrutinizer may propose an additional cause and the diagram presenter may accept it if its impact is significant. The additional cause reservation is

important because eliminating only one of multiple independent causes will not overcome the effect entirely.
See: categories of legitimate reservation, scrutiny, sufficiency-based logic.

additive rule – This rule states that local values of a given parameter can be added together to calculate the global value.
Perspective: In the cost-world paradigm, the cost savings in one department are added to the cost savings in every other department to determine overall impact; in this manner the cost-world paradigm follows the additive rule when it claims that global improvement is the sum of all the local improvements. In the throughput-world paradigm of TOC, the throughput of one department can NOT be added to the throughput of every other department to determine global throughput; thus throughput does not follow the additive rule. In the throughput-world paradigm global improvement is NOT the sum of all the local improvements.
See: cost-world paradigm, throughput-world paradigm.

aggregated variability – 1. The fact that the statistical fluctuation of the time required to complete a series of dependent events/processes is less than the sum total of the statistical fluctuations of each event/process. 2. In a distribution system the variation in demand is less at an aggregation point, such as a warehouse, than at the individual consumption points.
Usage: Drum-buffer-rope uses this concept to strategically locate a small number of buffers that usually result in a significant reduction in total inventory and an increase in due date performance. Critical chain project management uses this concept to strategically locate buffers that protect series of task which usually results in a significant reduction in project duration and an increase in due date performance. The distribution/replenishment solution reduces the amount of inventory held at consumption points and instead focuses on holding the appropriate level of inventory buffers at aggregation points which usually results in significant reduction in the total inventory in the system and an increase in fill rate.
See: buffer, critical chain project management, distribution/replenishment solution, drum-buffer-rope, statistical fluctuations and dependent events.

alignment of responsibility and authority – This well known organizational behavior principle is the primary injection to the lieutenant's evaporating cloud, or conflict cloud, in the management of human behavior.
Illustration: In this story line, the company has experienced problems in the past when multiple people inside the company speak directly to the customer. A policy was established that only the account manager can speak with the customer. It happened, however, that the account manager was not available when the shipping manager needed to ask the customer a question about an order that needed to ship immediately or it would be late. The shipping manager (the "lieutenant") was responsible to ship the order on time but lacked the authority to contact the customer in order to get the information needed to fulfill his/her responsibility. As shown in the cloud below, the injection (as shown in the square-cornered rectangle) to evaporate this cloud is giving the lieutenant the authority to contact the customer when it has a direct impact on his/her ability to fulfill the responsibility of shipping on time.



See: assumption, evaporating cloud, injection, lieutenant's cloud.

ambitious target – A goal that is considered to be very desirable and yet appears to be unattainable.

Example: The following statement would be an ambitious target for most firms: "Our company will have annual net profit equal to current total sales within the next four years".

Usage: For the vast majority of managers, there is uncertainty surrounding how to go about achieving an ambitious target. A prerequisite tree is the thinking processes logic tool used to determine how to achieve an ambitious target.

See: prerequisite tree, thinking processes.

'and' connector

Syn: logical 'and' connector, conceptual 'and' connector.

See: logical 'and' connector.

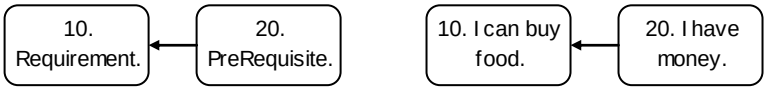
arrow as a connector – Use of an arrow in logic diagrams to denote a logical connection between related entities.

Usage 1: In sufficiency-based logic diagrams such as the current reality tree, future reality tree, and transition tree, the arrow denotes an "if..., then..." causality relationship. As shown in Illustration 1, the cause is at the tail of the arrow and the effect is at the point of the arrow.

Illustration 1: The sufficiency-based logic diagram on the right is verbalized, "If, 10. My car is out of gas, then, 20. I can not drive my car."

Usage 2: In necessity-based logic diagrams such as the evaporating cloud and the prerequisite tree, the arrow indicates that entity at the tail of the arrow is a necessary condition for the existence of the entity at the point of the arrow.

Illustration 2: The necessity-based logic diagram on the right is verbalized, "In order that, 10. I can buy food, it is necessary that, 20. I have money."



See: entity, necessity-based logic, sufficiency-based logic.

assembly buffer – Time protection used in an operations environment to ensure that parts that do not flow through a constraint resource, but are assembled with parts that do, are released early enough so that the probability is very high that the constraint parts will continue to flow without delay once they arrive at the assembly operation.

Usage: The assembly buffer is not as commonly used as the constraint and shipping buffers. If variation affecting parts not going through the constraint, capacity constrained resource (CCR) or drum resource degrades system performance, an assembly buffer should be used. This type of buffer is not used in Simplified DBR (S-DBR).

See: buffer, constraint buffer, S-DBR, shipping buffer, time buffer.

assumption – A statement, condition, or belief about why a logical relationship exists between entities.

Usage: Assumptions may or may not be shown or verbalized on a logic diagram, but they always exist. Further, assumptions may or may not be valid. Every logical relationship portrayed in all thinking processes (TP) logic diagrams has one or more underlying assumptions. Some assumptions are considered to be 'oxygen', that is, true and well understood by most people throughout our world, and thus, do not have to be documented. When a scrutinizer says, "what's underneath the arrow?" he/she is really asking the TP diagram creator to explain the assumption(s) that allows two entities to be logically connected.

Illustration 1: In sufficiency-based logic diagrams such as the current reality tree, future reality tree, and transition tree, an assumption is often considered to be a valid condition for the system being assessed and usually is accepted without question. The following diagram is verbalized, “If, 10. I have a dog, then, 30. I have an animal, because, All dogs are animals.” The statement “All dogs are animals”, is the underlying assumption.

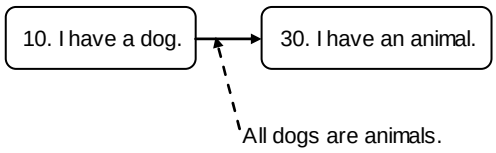
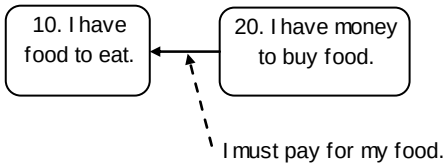


Illustration 2: In necessity-based logic diagrams such as the evaporating cloud and the prerequisite tree, the rationale for the necessary condition is verbalized as follows: “In order that, 10. I have food to eat, it is necessary that, 20. I have money to buy food, because I must pay for my food.” The latter phrase is the assumption.



See: evaporating cloud, necessary condition; necessity-based logic; sufficiency-based logic, thinking processes.

BM – Abbreviation for buffer management.

bottleneck resource – Any resource whose capacity is less than or equal to the demand placed on it for the specified time horizon.

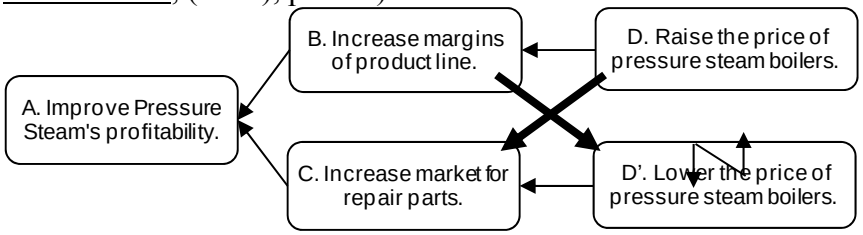
Usage: Often this term is confused with or incorrectly used interchangeably with similar terms like capacity constrained resource, drum resource and/or constraint.

See: capacity constrained resource, constraint, drum resource.

breakthrough injection – A special state of being or condition designed to dramatically resolve the conflict. This injection is often a highly creative, win-win, out-of-the-box solution to a chronic conflict.

Usage: Usually, there is no experience in the organization with this type of solution. Creating a breakthrough injection is much more than restructuring a compromise or making a minor change to resolve the conflict. Often, a breakthrough injection goes beyond the surface conflict to address a deeper or more generic conflict. Most of TOC's proven solutions such as drum-buffer-rope, buffer management, critical chain, and pull distribution are considered to be breakthrough injections.

Illustration: The decision to sell comprehensive maintenance and repair service to Pressure Steam's customers is the breakthrough injection that evaporated the cloud that expressed the conflict of their need to lower prices and raise prices at the same time. (Reference: Goldratt, It's Not Luck, (1994), p. 252.)



See: chronic conflict, injection, generic cloud.

buffer – Protection against uncertainty. The protection is aggregated and may take the form of time, stock (inventory), capacity, space or money.

Perspective: The use of buffers in TOC logistical solutions is a key element that differentiates it from other solutions. TOC claims that in a system that has statistical fluctuations and dependent events buffers are necessary to manage the system and to focus improvement efforts.

See: assembly buffer, capacity buffer, drum buffer, feeding buffer, hole, project buffer, shipping buffer, statistical fluctuations and dependent events, stock buffer, time buffer, space buffer.

buffer burn rate – The rate at which the project buffer is being consumed in critical chain project management. The rate is calculated as the ratio of the percent of penetration into the project buffer and the percent of completion of the critical chain. A buffer burn rate of 1.0 or less is good.

Usage: Some people calculate the burn rate of buffers other than the project buffer. When doing so, use the longest chain of work remaining which feeds into the buffer that is being analyzed.

Illustration: If the project buffer is 40% penetrated and the critical chain is only 20% complete, the buffer burn rate is 40/20 = 2.0. The project manager has a warning that there is a problem, and if it continues, it will possibly jeopardize the project due date.
See: buffer, critical chain, project buffer.

buffer management (BM) – A feedback mechanism used during the execution phase of operations, distribution, and project management that provides a means to prioritize work, to know when to expedite, to identify where protective capacity is insufficient, and to resize buffers when needed.

Usage: In operations, work is released into the production system a specific time interval, known as the buffer, prior to its scheduled processing at the constraint. The time buffer, is divided into three zones known as the green zone (region I), the yellow zone (region II), and the red zone (region III). During the first 1/3 of the time buffer, an order is said to be "in the green zone"; during the middle 1/3 it is "in the yellow zone"; and in the final 1/3 of the time buffer it is "in the red zone". Work should typically arrive at the "bank" of work in process in front of the constraint when the order is in the yellow zone. If it has not arrived when the order is in the red zone, (this is often referred to as there being a 'hole' in the red zone), the job is located, usually marked in some way, such as with a red tag, and expedited if necessary.

Records are kept of which work areas are causing holes in the red zone. This information is used to direct continuous improvement efforts and /or to resize buffers.
See: buffer, green zone, hole, red zone, time buffer, yellow zone.

buy-in – A rigorous process of leading a group to full consensus on a solution. The process is designed to overcome the 'layers of resistance'. The steps are the following:

1. Agree on the problem
2. Agree on the direction of the solution
3. Agree that the solution solves the problem
4. Agree that the solution will not lead to any significant negative effects
5. Agree on the way to overcome any obstacles that might block or distort implementation of the solution
6. Overcome unverbalized fears

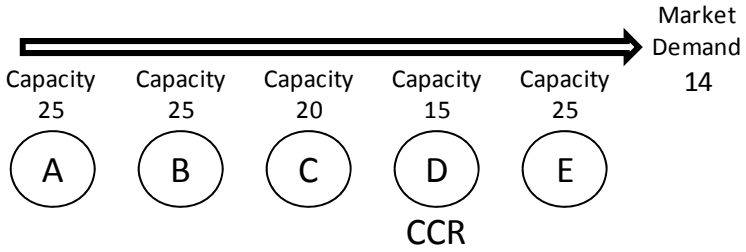
See: layers of resistance.

capacity buffer – A time interval used only in multi project environments that restricts the release of new projects into the system, ensuring the effective use of the drum resource. It also helps reduce the amount of work in process inventory, or number of tasks in progress in a multi project environment. This buffer is based on the capacity of a resource or resource skill set (e.g., firmware engineers).

Usage: The capacity buffer ensures that there is enough stagger between the start of projects to minimize peak loads on all resources. It also minimizes delays on the drum resource tasks so delays in one project do not delay the start of drum tasks in the succeeding projects.
See: drum resource.

capacity constrained resource (CCR) – Any resource that, if its capacity is not carefully managed, is likely to compromise the throughput of the organization. (Also called capacity constraint resource.)

Illustration: In the example shown below the production line has five resources (A through E) and their respective capacities are listed. Resource D experiences enough variation in output that if it is not carefully managed, output will drop below demand and throughput of the system will go down; therefore "D" is a CCR.



See: constraint, throughput.

categories of legitimate reservation (CLR) – The rules for scrutinizing the validity and logical soundness of thinking processes logic diagrams. Seven logical reservations are grouped into three levels. Level I: clarity reservation. Level II: causality existence and entity existence reservations. Level III: cause insufficiency, additional cause, predicted effect existence, and cause-effect reversal (tautology) reservations.

Usage: Level I seeks clarity and understanding of the tree builder's intentions, that is, finding out what the words and phrases in the logic diagrams' entities really mean and how they are being used. Level II examines the validity of an entity: does the entity really exist; and, does the causal relationship between specified entities really exist. In each of Level III's four reservations, the scrutinizer must actively assist the presenter by proposing a change such as adding or changing some words and/or suggesting a missing condition or an entity that appears to be omitted. Scrutinizers should precede from level I to level II to level III reservations until they have satisfied their concerns. That is, they should first seek clarity, next assure appropriate causality, and finally propose improvements in a logic diagram. Note that the tree builder is free to accept or reject any reservation at any level.

See: additional cause reservation, causality existence reservation, cause insufficiency reservation, cause-effect reversal reservation, clarity reservation, entity, entity existence reservation, logic diagram, predicted effect existence reservation, scrutiny, thinking processes.

causality existence reservation – A Level II reservation in the categories of legitimate reservation that is used to question whether or not the proposed causal relationship between two entities really exists.

Usage: Even though the tree builder/presenter and the scrutinizer might agree that both the cause and the effect exist, the effect may not be an unavoidable consequence of the cause. As shown in Illustrations 1 and 2, a scrutinizer may ask: "How does the causal entity lead to the proposed effect?"

Illustration 1: Examining the following logic diagram, a scrutinizer might ask, "How does gambling produce financial security?"

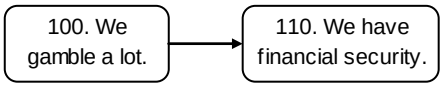
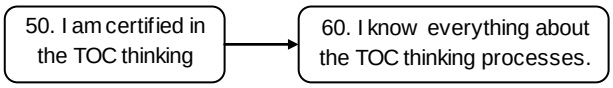


Illustration 2: Examining the following logic diagram, a scrutinizer might ask, “How does being certified in a field or discipline assure that you know everything about the subject?”



See: categories of legitimate reservation, entity, scrutiny, thinking processes.

cause-effect – A linkage or relationship between entities where the existence of one (or more) entity(ies) is(are) said to be the reason for the existence of the other entity(ies). Causality is established if the stated effect always exists when the stated cause(s) is (are) present.

Illustration 1: The following logic diagram is verbalized, “If, 15. Cause A, then, 25. Effect X.” For example, “If it rains on my yard, then my grass gets wet.”

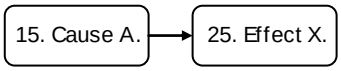
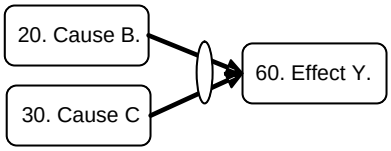


Illustration 2: Sometimes two or three causal entities are all needed to create the existence of the proposed effect. The following logic diagram is verbalized, “If, 20. Cause B, and, 30. Cause C, then, 60. Effect Y.” For example, “If my vegetable garden gets ample water, and my garden gets a satisfactory amount of sunshine, then the vegetables will grow well.”



Perspective: In contrast to statistical correlation, causality represents a much stronger directional relationship between two entities than does their correlation or association with one another.

See: effect, entity, logic diagram, logical ‘and’ connector.

cause-effect reversal reservation – A Level III reservation in the categories of legitimate reservation that is used to question whether the cause and effect have been switched. This is also referred to as tautology.

Usage: Sometimes a cause-and-effect relationship can be reversed or turned around. This usually happens when the effect is deduced based on the facts rather than by answering the question, "What caused the effect?" or "What causes what?"

Illustration 1: The following logic diagram is verbalized, “If, 100. I buy dog food, then, 110. I have a dog.” The causality is incorrect because buying the dog food did not cause you to have a dog. Reversal of the causality arrow corrects the diagram so it reads, “If, 110. I have a dog, then, 100. I buy dog food.”

Incorrect: Correct:

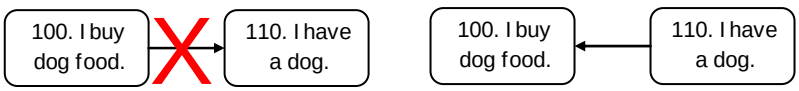
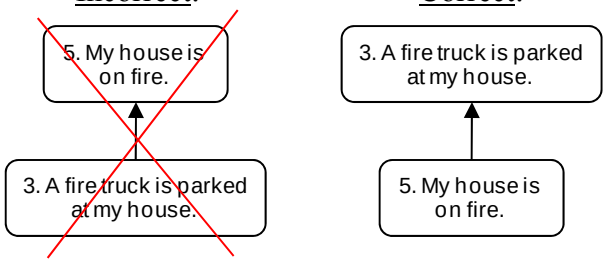


Illustration 2: The "House-on-Fire" scenario is a specific example of cause-effect reversal. The illustration on the left below is verbalized, "If, 3. A fire truck is parked at my house, then, 5. My house is on fire." However, the causality is actually the reverse, as illustrated on the right. "If, 5. My house is on fire, then, 3. A fire truck is parked at my house."

Incorrect: Correct:



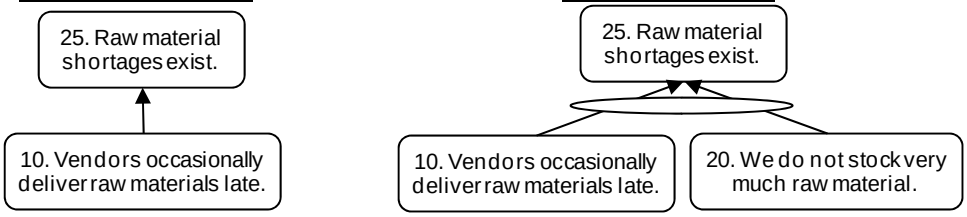
See: category of legitimate reservation, effect, entity, logic diagram, logical 'and' connector.

cause insufficiency reservation – A Level III reservation in the categories of legitimate reservation (CLR) that is used when the scrutinizer believes the proposed cause alone is inadequate to explain the effect.

Usage: For this type of CLR, the scrutinizer must provide the missing supporting cause that, in conjunction with the original cause, produces the effect. Note that if the scrutinizer is correct, then if either of the proposed causes does not exist, then the observed effect will also not exist.

Illustration: The occurrence of occasional late deliveries of raw materials from our vendors is believed by the scrutinizer to be insufficient to cause raw material shortages. The scrutinizer proposes that it is the combination of occasional late deliveries by our vendors and the fact we use a just-in-time inventory replenishment system for raw materials that causes raw material shortages to exist.

Cause Insufficient: Cause Sufficient:



See: category of legitimate reservation, effect, entity, logic diagram.

CCC – Abbreviation for core conflict cloud.

CCPM – Abbreviation for critical chain project management.

CCR – Abbreviation for capacity constraint resource.

CCRT – Abbreviation for communication current reality tree.

chain analogy – The comparison of an organization to a chain based on the belief that, just as a chain accomplishes work through a series of dependent links, an organization produces output

through a series of dependent "links." Just as the limiting factor in a chain's ability to do work is its weakest link, an organization's ability to achieve its goal has some limiting factor, which is called the constraint.

Example: In a manufacturing company, the "links" could be marketing, sales, engineering, procurement, production, and shipping. Shipping can not ship the product until it is produced. Production can not make the product until the parts are purchased. Etc.

Perspective: The chain analogy is useful because, strengthening most links in a chain will not make the chain stronger – you must strengthen the weakest link. In a similar manner, quickly generating significant improvement in organizational performance cannot be accomplished through improvements anywhere and everywhere, but rather only through focusing on the factor that is limiting global performance, i.e. by focusing on the constraint.

See: constraint.

change sequence – The three stages that must be completed in the successful management of change within a system. The change sequence answers the following three questions: 1. What to change? 2. To what to change? and, 3. How to cause the change?

See: process of on-going improvement, what to change?, to what to change?, how to cause the change?.

chronic conflict – A contentious situation that has continued to exist for a prolonged period of time. Opposing sides have been justifying their perspective through selective requirements and prerequisites for so long that both sides become entrenched in their own beliefs to the point that neither side can see how to break the conflict without suffering a significant loss.

Usage: Breaking a chronic conflict requires understanding the opposing perspectives. This understanding can lead to the surfacing of hidden assumptions underlying entity relationships that are often the key to creating a breakthrough solution. The solution to a chronic conflict requires one side to offer up a problematic (from their perspective) injection and the other side to somehow eliminate any of the undesirable aspects of the proposed injection using negative branch reservations (NBRs).

See: assumptions, breakthrough solution, entity, evaporating cloud, generic cloud, injection, prerequisite, requirement, negative branch reservation.

clarity reservation – A Level I reservation in the categories of legitimate reservation that is used when the scrutinizer (1) is concerned about the meaning of the statement contained in an entity or (2) does not recognize a reasonable connection between the stated cause and the stated effect.

Usage: Common clarity reservations include definitions of words, meaning or use of acronyms, phrases, pronouns, word sequences, or confusing punctuation, and too brief an entity description such as a sentence fragment, and compound subjects, verbs, or sentences within an entity. Providing verbal clarity may be sufficient for understanding the diagram, and thus, the tree builder/presenter may not necessarily have to edit an entity to satisfy a scrutinizer. Similarly, clarification of a relationship between linked entities may be sought by a scrutinizer. Here again, after an appropriate explanation, it may or may not be necessary to edit the relationship being challenged. Examples of both types of clarity are shown below.

The Level I clarity reservation is usually the first reservation that is raised by a scrutinizer because it is appropriate to try to understand the entity or relationship between entities before raising a higher Level II or III reservation.

Illustration 1: Consider the entity below, "100. There is a pretty little girl's school." Clarity is needed to determine if this an attractive school for girls? Or, is it a nice-looking small school for girls? Or, is it a school for small girls? Or, is it the school of one particular pretty girl?

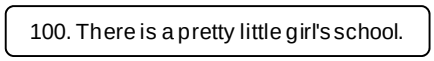
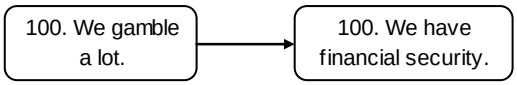


Illustration 2: Consider the relationship between the two entities, 100 and 110. A scrutinizer might ask for clarity on how gambling provides financial security since, to gamble is to take a risk which seems to be the antithesis of financial security.



See: categories of legitimate reservation, scrutiny.

cloud
Syn: evaporating cloud, conflict cloud, conflict resolution diagram.
See: evaporating cloud.

communication current reality tree (CCRT) – A simplified or abridged version of the current reality tree developed to obtain buy-in from organizational personnel including employees, management, and/or board members.
Usage: The CCRT connects the core conflict cloud at the base of the logic tree with the undesirable effects (UDEs) associated with the appropriate side of the conflict. This design facilitates communication with management because the CCRT reduces the likelihood of "finger pointing" which leads to defensive postures that block progress toward real solutions. The CCRT accomplishes this by clearly showing that the UDEs result from a systemic conflict and not from the irrational behavior of individuals.
See: buy-in, core conflict cloud, current reality tree, undesirable effect.

completion buffer
See: project buffer.

conceptual 'and' connector
Syn: logical 'and' connector, 'and' connector.
See: logical 'and' connector.

conflict cloud (CC)
Syn: cloud, conflict cloud, conflict resolution diagram, evaporating cloud.
See: evaporating cloud.

conflict resolution diagram (CRD)
Syn: cloud, conflict cloud, conflict resolution diagram, evaporating cloud.
See: evaporating cloud.

constraint – The factor which, if the organization had more of, could more fully exploit, or could more effectively subordinate to, would result in achieving more of the goal.

Perspective: The existence of a system constraint and leveraging the organization with this knowledge is the foundation of TOC.

Illustration: In "The Goal" (Goldratt, North River Press, 1984) the company could not produce orders fast enough to meet market demand and two resources were the limiting factors: the NCX 10 machine and a heat treat furnace. These resources were the constraints for UNICO. As UNICO was able to more fully exploit and subordinate to the NCX 10, and to elevate the heat treat furnace through outsourcing, UNICO was able to increase profits. As UNICO continued to exploit the performance of the constraints they eventually had the ability to produce more than their customers were buying, the constraint shifted to the lack of customer orders and the company had a market constraint. UNICO then had to shift the approach of the company to exploit and subordinate to this external constraint.

See: elevate, exploit, subordinate.

constraint buffer – The time buffer offset used to schedule the release of materials that feed the constraint. The constraint buffer is sized to dramatically reduce the likelihood that variation in the system prior to the constraint will cause the constraint to "starve", (i.e., not have what it needs in order to meet customer demand), yet will not result in excessive work in process inventory.

Usage: If a constraint exists in production, a constraint buffer and a shipping buffer are used to protect the output of the system. If the constraint is in the market, the constraint buffer is unnecessary and only the shipping buffer is used. The constraint buffer is not used in S-DBR.

Perspective: The TOC approach of buffering the constraint is a major difference from many other production management approaches. This difference is important because if there is a constraint in operations, this buffer enables the system to more fully to exploit the constraint, thereby increasing throughput.

See: buffer, buffer management, shipping buffer.

constraints accounting

See: throughput accounting.

control point – A key point in the flow of work through an operations environment that, if not managed properly, has a high probability of decreasing due date performance. Control points include gating operations, convergent points, divergent points, constraints, and shipping points.

Usage: In TOC operations management, sequencing schedules at the control points to match the drum schedule and/or shipping schedule increases the probability of on time performance.

See: constraint, convergent point, divergent point, drum schedule, shipping schedule.

convergent point – An operation in a production process where multiple materials/parts/components are combined into a single component. An assembly operation is an example of a convergent point.

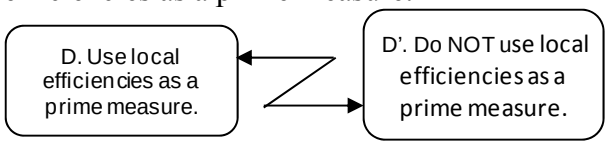
Usage: Convergent points are common in an A-plant and are usually used as control points.

See: A-plant, control points.

core conflict – The systemic conflict that causes the vast majority of the undesirable effects in the current reality of the system being studied. The core conflict is often generic in nature and can be derived by generalizing the various conflicts that underlie the undesirable effects that persist in the system.

Usage: In the three cloud approach, the core conflict is synthesized from three specific conflict clouds that together reflect a fundamental issue responsible for most of the system's undesirable effects. A core conflict is expressed in two prerequisites in the core conflict cloud, namely, entities D and D'.

Illustration: A core conflict in operations, which is depicted here, exists because it is not possible to do both "D. Use local efficiencies as a prime measure," and "D'. Do NOT use local efficiencies as a prime measure."

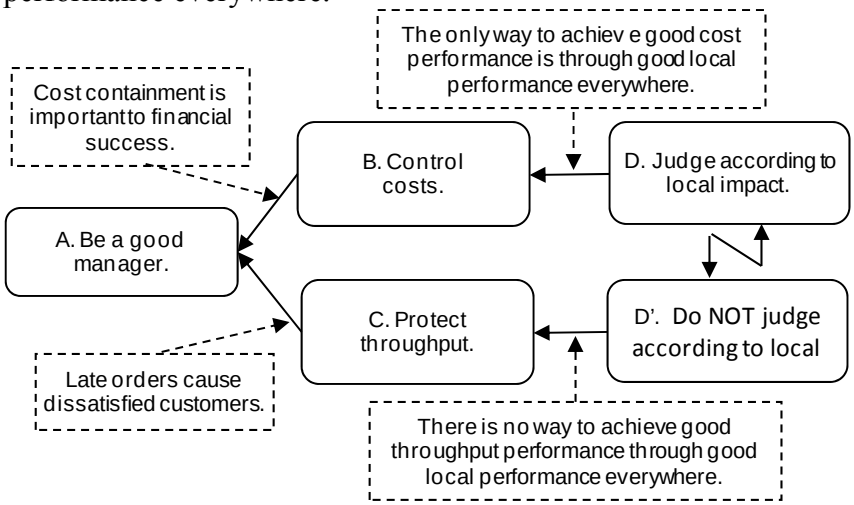


See: conflict clouds, current reality tree, prerequisite, three cloud approach, undesirable effect.

core conflict cloud (CCC) – An evaporating cloud which depicts the core conflict present in the current reality of the system being studied. The CCC denotes the system's goal (entity A), two requirements to achieve the stated goal (entities B and C), and the respective prerequisites (entities D and D'). The prerequisites in entities D and D' are in direct conflict, and often represent two opposing points of view.

Usage: It is relevant to list the assumptions underlying each of the cloud's entity relationships in the CCC. An assumption which is not valid, that is, erroneous, or can be invalidated through an injection is often key to eliminating the core conflict. Sometimes one of the assumptions is the core problem.

Illustration: The CCC shown for finance and measurements includes some assumptions, which are shown as entities in dashed rectangles with dashed line boundaries. The top branch of the CCC is verbalized as follows. "In order to, A. Be a good manager, it is necessary to, B. Control costs, because," (assumption), "Cost containment is important to financial success. Further, in order to, B. Control costs, it is necessary to, D. Judge according to local impact, because," (assumption), "The only way to achieve good cost control is through good local performance everywhere."



See: assumptions, evaporating cloud, generic conflict cloud, goal, prerequisite, requirement.

core driver – An entity, often at the bottom of a current reality tree, which does not have any cause(s) indicated. It is a descriptor of the environment and influences the problem area but is beyond the domain of management's control or influence or represents an entity that management does not want to address for some reason.

See: entry point, current reality tree, core problem.

core problem – A fact, or conflict, or erroneous assumption that is the source of at least 70% of the undesirable effects in the current reality of the system being studied.

Perspective: A core problem can have three manifestations either as 1. a fact, such as "efficiency is used as the prime measure in operations," or, 2. the conflict between D and D' in a core conflict cloud, such as "D. Use local efficiencies as a prime measure, and D'. Do not use local efficiencies as a prime measure," or, 3. an erroneous assumption responsible for the conflict, such as, "A resource standing idle is a major waste."

See: assumption, core driver, core conflict, core conflict cloud, current reality tree, undesirable effects.

cost-world paradigm – The view that a system consists of a series of independent components, and the cost of the system is equal to the summation of the cost of all the sub systems. This view focuses on reducing costs and judges actions/decisions by their local impact. Cost allocation is commonly used to quantify local impact.

Usage: In the cost-world paradigm, global impact is the sum of all the local impacts.

Perspective: This paradigm is in conflict with the throughput-world paradigm which claims that global improvement is NOT the sum of local improvement and the use of cost allocation often points decision makers in the wrong direction.

See: global, local, throughput-world paradigm.

critical chain – The longest sequence of dependent events through a project network considering both task and resource dependencies in completing the project. The critical chain is the constraint of a project.

Usage: The critical chain plus the project buffer determines the lead time for the project. If no resource contention exists, then the critical chain would be the identical to the critical path.

See: critical chain project management.

critical chain project management (CCPM) – The TOC solution for planning, scheduling, and managing performance in a project environment. It is applied in two very different environments; single project environments and multi project environments where resources are shared across several different projects concurrently.

Usage: In a single project environment the solution includes the following: 1. removal of existing behaviors which are harmful to the goal of the project, such as the student syndrome and work expanding to fill the available time; 2. a plan, or project network, that includes all task and resource dependencies as well as time estimates with safety removed; and, 3. a schedule showing the critical chain and the buffers (which consist of half of the safety time removed from the individual tasks).

For a multi project environment the solution has the elements of the single project environment as well as staggering the release of projects according to a synchronizing mechanism known as the drum. The drum can be either physical, that is, a resource, or virtual, such as a rule stating we have no more than 6 projects in flow at any one time.

For both environments there is an additional element of project control and visibility, namely buffer management. CCPM requires frequent updates of estimated time required to complete in-progress tasks. This information is used to update the status of the various buffers, which in turn provides the information needed to know when corrective action is truly necessary.

See: buffer, buffer management, critical chain, drum feeding buffer, drum resource, drum schedule, feeding buffer, project buffer.

CRT – Abbreviation for current reality tree.

current reality tree (CRT) – A thinking processes sufficiency-based logic diagram that facilitates answering the first question in the change sequence, namely, "what to change?" The CRT is a diagram that illustrates the cause-effect relationships that exist between the core problem and the most, if not all, of the undesirable effects (UDEs).

Usage: By understanding why the UDEs exist, the system improvement team is able to design a set of interventions or injections to eliminate the core conflict, and hence, the vast majority of the UDEs.

The CRT uses "if..., then..." logic to present unbroken chains of cause-effect relationships from the core problem or core conflict upward to the (UDEs). It also presents sequences of entities which depict system-based policies leading to relevant measurements, which in turn, cause undesirable behaviors to occur. The CRT is often used when, 1) it is not clear how to implement one or more of the five focusing steps or, 2) the system improvement team has trouble obtaining managerial buy-in of proposed changes.

See: buy-in, change sequence, core conflict, core problem, injection, sufficiency-based logic, thinking processes, undesirable effects, what to change?.

customer current reality tree – A form of current reality tree (CRT) that focuses on the undesirable effects (UDEs) of an organization's customers, rather than the UDEs of the organization itself. This CRT is a sufficiency-based logic diagram that illustrates the cause-effect relationships that exist between the customer's core problem and the most, if not all, of the UDEs caused by their suppliers.

Usage: The customer CRT is designed to demonstrate that the organization understands the problems that their customer is experiencing in dealing with them and similar suppliers. Moreover, the customer CRT identifies those areas of customer concern where the organization can assist its customer by improving their performance through adding value, thereby providing the organization with a competitive advantage.

Because this logic tree requires a detailed knowledge of the problems experienced by the organization's customers, some of the customer's employees and marketing and sales personnel from the organization are usually closely involved in the creation of the customer CRT. By agreeing to address the customer's core problem with their suppliers through the design of an unrefusable offer, the customer CRT helps create a win-win scenario for both the organization and the organization's customer.

See: core problem, current reality tree, sufficiency-based logic, thinking processes, undesirable effect, unrefusable offer.

DBR – Abbreviation for drum-buffer-rope.

dependent events – A series of events in which each requires the output of certain preceding event(s) before it can be completed properly.

Usage: TOC claims that in systems with statistical fluctuations and dependent events operations are best managed using the concepts of drum-buffer-rope or critical chain project management.

Example: A conventional dine-in restaurant is a system of dependent events: the customer will not pay for the meal before the meal is eaten, and they cannot eat before the food is served, and the meal can not be served before the order is placed, and the order is not placed before the customers are seated at a table. Each event in the system is dependent of the preceding event.

See: critical chain project management, drum-buffer-rope, statistical fluctuations and dependent events.

desirable effect (DE) – A positive or beneficial outcome associated with an organization's actual or future performance. DEs are often the opposite of an UDE.

Usage: When appearing in a future reality tree, DEs may be (1) exact opposites of their corresponding UDEs or they may be (2) conditions that signify that the undesirable aspects present in a current reality tree have been overcome.

Example 1: For the UDE "Throughput is declining," the corresponding DE would be, "Throughput is increasing."

Example 2: For the UDE "Production lead times are too long," the corresponding DE could be "Production lead times are less than competitors' lead times."

See: current reality tree, future reality tree, operating expense, throughput, undesirable effect.

distribution/replenishment solution - A pull distribution method that involves setting stock buffer sizes and then monitoring and replenishing inventory within a supply chain based on the actual consumption of the end user, rather than a forecast. Each link in the supply chain holds the maximum expected demand within the average replenishment time, factored by the level of unreliability in replenishment time. Each link generally receives what was shipped or sold, though this amount is adjusted up or down when buffer management detects changes in the demand pattern.

Usage: The largest amounts of inventory are held at a central warehouse where the variation in demand is the least. Smaller amounts of inventory are held and are replenished frequently at the end consumer location where variation in demand is the greatest. Throughput dollar days and inventory dollar days are measures used to judge the reliability and effectiveness, respectively, of each link in the chain. Transfer pricing is not used.

See: operating expense, inventory, inventory dollar days, throughput, throughput dollar days.

divergent point – An operation in a production process where the material can be transformed into multiple products.

Example: In textile mill, the dyeing process is a divergent point because the yarn can be dyed several different colors.
Usage: Divergent points are common in a V-Plant and are usually used as control points to direct flow correctly through a plant. It is generally important to control lot sizes at a divergent point so that material is not over allocated to some downstream product in order to increase local efficiency.
See: control point, V-plant.

driving down – The process of searching for the unknown cause of one or more entities.
Usage: This is a discovery process that is often required in creating the current reality tree (using the old method, rather than the newer three cloud approach) or in satisfying a cause insufficiency reservation in the categories of legitimate reservation. The phrase driving down is also referred to as "diving down" or as "drilling down".
See: categories of legitimate reservation, cause insufficiency reservation, current reality tree, entity.

drum – One of the three devices required for proper management of operations. (The other two are buffer and rope.) The drum governs the rate of output for the entire system and is the only resource that is scheduled.
See: buffer, drum-buffer-rope, drum resource, drum schedule, rope.

drum-buffer-rope (DBR) – The TOC method for scheduling and managing operations.
Usage: DBR uses the following: 1. the drum, generally the constraint or CCR, which processes work in a specific sequence based on the customer requested due date and the finite capacity of the resource; 2. time buffers which protect the shipping schedule from variability; and, 3. a rope mechanism to choke the release of raw materials to match consumption at the constraint. Simplified drum-buffer-rope (SDBR) is used to manage production where there is not a constraint or the need to manage a drum resource.
Both DBR and S-DBR use buffer management to continuously improve a production environment.
See: assembly buffer, buffer, buffer management, capacity constrained resource, constraint buffer, drum resource, drum schedule, shipping buffer, simplified drum-buffer-rope.

drum feeding buffer –The time cushion placed in the project plan immediately in front of the first use of the drum resource for a specific project in a multi project critical chain environment to protect the start of a new project against variation (Murphy) at the drum resource, and, as a benefit, enables project acceleration if the drum resource is available early.
Usage: A drum buffer only exists in a multi project environment.
See: buffer, critical chain project management, drum resource.

drum resource – 1. The resource used in operations (generally the system constraint or capacity constrained resource) that sets the pace for the entire system. 2. The resource in multi project management environments that most limits the systems' ability to complete more projects or, if there isn't a most heavily loaded resource, the resource that is used to stagger projects.
See: critical chain project management, drum-buffer-rope, drum schedule.

drum schedule – The detailed work schedule for operations that sets the pace for the entire system. The drum schedule must be based on market demand and the finite capacity of the system constraint.

Usage: In operations, the drum schedule combined with the rope mechanism helps limit work in process inventory which, in turn, reduces lead time and increases system performance.

In a multi project environment using critical chain project management the drum schedule determines the planned start and estimated completion dates of projects using the drum resources and therefore sets the pace and determines how many projects a system can complete within a specified time period.

See: critical chain project management, drum-buffer-rope, drum resource.

dry tree – Any thinking processes logic tree that has been scrutinized for validity using the categories of legitimate reservation and is considered to be very solid or tight from a logical perspective.

Perspective: Opposite of a "wet tree" which is considered to be not very solid or logically tight.

See: categories of legitimate reservation, scrutiny, wet tree.

EC – Abbreviation for evaporating cloud.

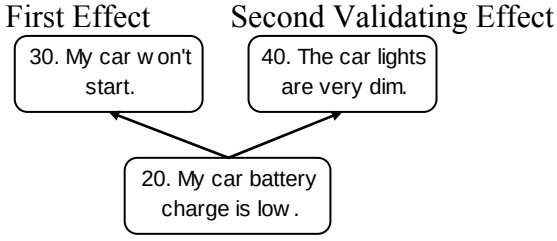
effect – An entity that is the direct result of one or more causes.

Illustration: A cause-effect diagram is shown. This relationship is verbalized, "If. 10. Cause, then, 20. Effect." For example, "If. 10. I default on a loan, then, 20. My credit rating goes down." A drop in my credit rating is an effect of defaulting on a loan.

See: cause-effect, entity.

effect-cause-effect – A method used to validate the existence of a cause-effect relationship for which the existence of the proposed cause is not easily provable through direct observation. This is done by proving the existence of a second effect that could only be present if the proposed cause actually exists.

Illustration: By showing that the second effect exists, the existence of the proposed common cause is demonstrated to be valid. In the logic diagram below, it is proposed that, "20. My car battery charge is low," is the cause of, "30. My car won't start." If it can be shown that, "40. The car's lights are very dim," that would support the existence of a low battery charge and provide reinforcement that it is the cause of the car not starting.



Possible Cause

See: cause-effect, entity.

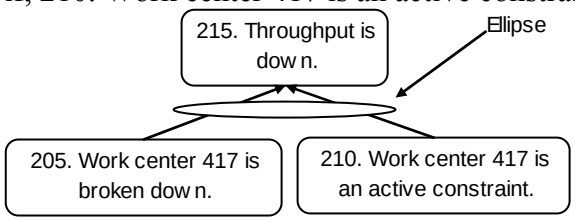
elevate – The key word in the fourth of the five focusing steps: elevate the system constraint. To elevate is to take actions that are not exploiting the constraint and/or subordinating to it, yet the result is that the system produces more goal units. These actions usually require investment or outsourcing.

Illustration: In the book "The Goal" (Goldratt, North River Press, 1984), the NCX 10 cannot produce enough output to meet the market demand. UNICO took many actions to exploit the NCX 10 and to subordinate to the need to exploit the NCX 10. However, they still could not produce enough system output to satisfy market demand. They elevated the capacity of the NCX10 by adding an old, less efficient piece of equipment that could perform the same operations as the NCX 10.

See: exploit, five focusing steps, subordinate.

ellipse – The graphical figure used to indicate a logical 'and' connection within a sufficiency-based thinking processes logic diagram by encompassing two or more arrows coming into an entity.

Illustration: In the following logic twig, both indicated causes, 205 and 210, must exist to cause 215 to exist. The diagram is verbalized: "If, 205. Work center 417 is broken down, and, if, 210. Work center 417 is an active constraint, then, 215. Throughput is down."

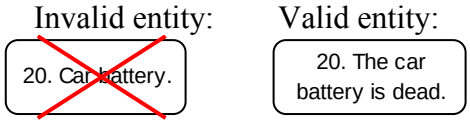


See: logic twig, logical 'and' connector, sufficiency-based logic, thinking processes.

entity – A single element enclosed within a geometric figure that describes a part of the system being studied using any thinking processes logic diagram. Effects, causes, actions, conditions, injections, intermediate objectives, and obstacles are all considered to be entities.

Usage: An entity should be stated as a complete sentence; however, the statement should not be a compound or a complex sentence.

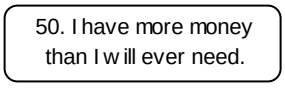
Illustration: The phrase, "20. Car battery" is not a valid entity. However, "20. The car battery is dead," is a valid entity because it is a complete sentence.



See: cause, effect, injection, intermediate objective, obstacle, thinking processes.

entity existence reservation – A Level II reservation in the categories of legitimate reservation that is used to challenge whether an entity exists in reality.

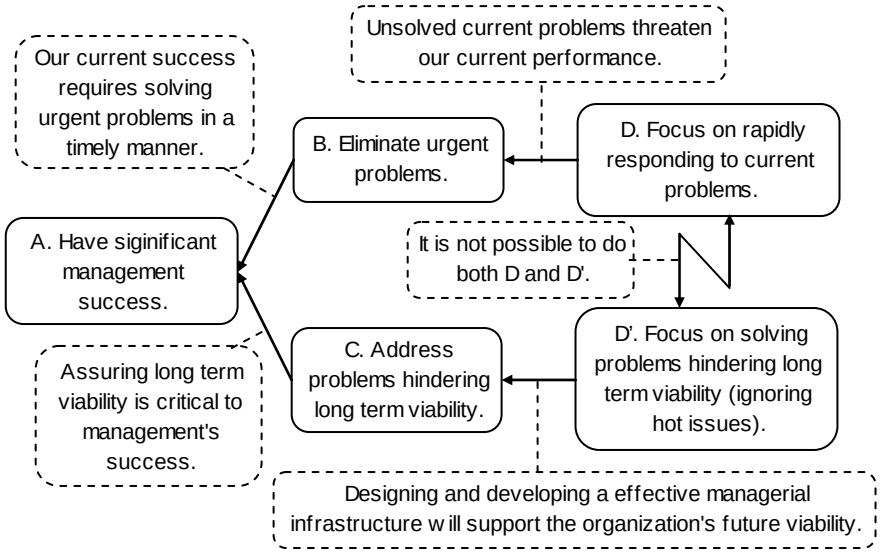
Usage: The scrutinizer of a thinking processes diagram may ask the question: "Does this entity really exist in your world as you have stated it?" The presenter then either proves its existence or modifies the entity or removes it from the logic diagram.
Illustration: For example, when scrutinizing the following entity a scrutinizer might say, "Please explain how entity 50 is possible."



See: categories of legitimate reservation entity, scrutiny, thinking processes.

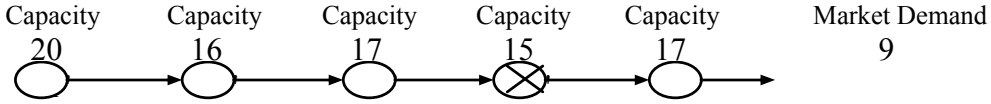
entry point – Any entity within a sufficiency-based logic diagram that does not have a cause or causes as indicated by the absence of an incoming arrow(s).
Usage: By convention, when creating a logic diagram, an entry point entity that is encased in a round-cornered rectangle is assumed to exist in the situation or the organization's current reality and may be designated as a fact of life. An entry point entity encased in a square-cornered rectangle is an injection, and may be either an action to be taken, or a condition or system state that does not yet exist.
See: entity, fact of life, core driver, injection, sufficiency-based logic.

evaporating cloud (EC) – A necessity-based logic diagram that describes and helps resolve conflicts in a "win-win" manner. It has two primary uses, first as a structured method to facilitate the description and resolution of a conflict, and second, as an integral part of the three cloud approach to creating a core conflict cloud which then forms the base of a current reality tree.
Usage: Initially, a brief storyline is developed that describes the conflict situation. Next, a five-entity diagram is made to capture the essence of the conflict. The five entities are one objective, a necessary condition and prerequisite for one side of the conflict and another necessary condition and prerequisite for the other side of the conflict. Five arrows represent the relationships between adjacent entities and allow the verbalization using necessity-based logic.
To resolve the conflict, assumptions underlying each of the evaporating cloud's (EC) relationships are identified. This surfacing of assumptions is the key to resolving the conflict presented in an EC by either: 1. revealing an erroneous assumption, or 2. identifying an assumption that can be invalidated by creating and implementing an injection. Either approach will resolve the conflict or "evaporate the cloud".
The situation presented in a cloud is verbalized by the following phrase: "In order to (entity at head of the arrow), I/we must (entity at the tail of the arrow) because (one or more of the surfaced assumptions)."
Illustration: A portion of the EC below is verbalized, "In order to, A. Have significant management success, we must, B. Eliminate urgent problems, because, Our current success requires solving urgent problems in a timely manner." The latter statement is an assumption.



Syn: conflict cloud, conflict diagram, conflict resolution diagram.
See: entity, necessity-based logic, objective, prerequisite, requirement, thinking processes, three cloud approach.

excess capacity – Capacity that is not used to either produce or protect throughput.
Illustration: In the example below, every resource in the described production process has considerably more capacity than the market is demanding. The exact amount of excess capacity is unknown because it is not clear how much protective capacity is needed for each resource.

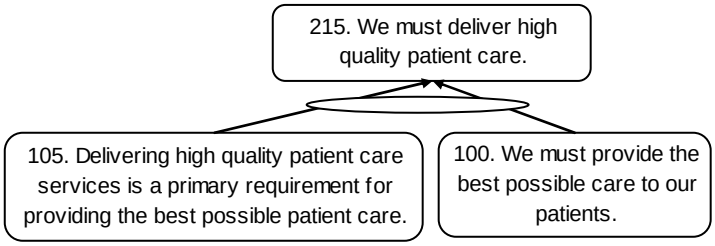


See: protective capacity, throughput.

exploit – The key word in the second of the five focusing steps: decide how to exploit the system constraint. It is the process of getting more goal units by taking actions that focus on the constraint.
Illustration: In the book "The Goal" (Goldratt, North River Press, 1984), when the constraint was the NCX10, actions that UNICO took to exploit it included staffing the machine during lunch, breaks, and shift changes which resulted in higher productive utilization of the constraint. They also increased the yield at the constraint by doing quality inspection just prior to the NCX10 so that any defective parts were pulled before wasting constraint time. In general, other actions used to exploit a constraint include, but are not limited to, creating a schedule for the constraint resource, implementing total productive maintenance, reducing setup times at the constraint, and implementing an unrefusable market offer when there is a market constraint.
See: constraint, five focusing steps, market constraint, unrefusable offer.

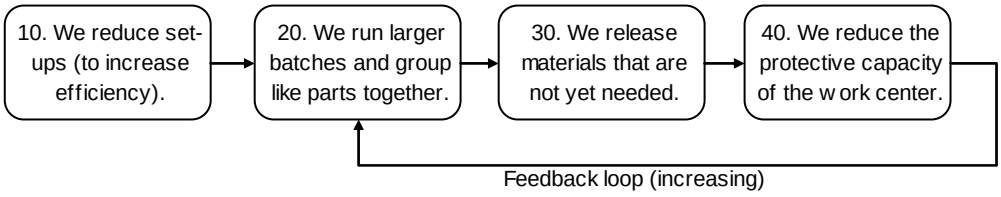
fact of life (FOL) – An entity placed on a thinking processes sufficiency-based logic diagram to improve or tighten the diagram's logic or clarify/justify the meaning of an adjacent entity.

Usage: In general, FOL documents the prevailing understanding or collective rationale of the TP diagram builder or team. By linking a FOL with one or two other related entities using a logical 'and' connector, a FOL provides a tight logical relationship sufficient to cause the subsequent entity.
Illustration: Entity 105 states that, "Delivering quality patient care services is a primary requirement for providing the best possible clinical patient care." It is considered to be a fact of life by the diagram builder. Using a logical 'and' connector (shown as an ellipse) to link entity 105 with entity 100: "Provide the best possible care to our clinic patients," provides the rationale that, in the tree builder's environment, logically yields entity 215: "We must deliver high quality patient care."



See: entity, logical 'and' connector, sufficiency-based logic, thinking processes.

feedback loop – An interconnected set of logical cause-effect relationships that produces either an increasing (positive) or decreasing (negative) condition or behavior within a system.
Usage: In contrast to traditional definitions of feedback where positive feedback is self-reinforcing effects and negative feedback creates a self-correcting or balancing effect, TOC defines feedback as only reinforcing, either positive or negative depending on the initial impetus. Typically, negative reinforcing loops are present in a system having problems whereas positive reinforcing loops are active in a well-performing system. In general, feedback involves both the transmission and the return of information. Since feedback loops exist in all real systems, it is important to actively seek them out for inclusion in any current reality and future reality tree diagrams.
Illustration: If, 10. We reduce set-ups in order to increase efficiency, then, 20. We run larger batches and group like parts together. If, 20. We run larger batches and group like parts together, then, 30. We release materials that are not yet needed. And, if 30. We release materials that are not yet needed, then, 40. We reduce the protective capacity of the work center. Cause-effect loops back from 40 to 20 because reducing protective capacity reinforces the inclination to run larger batches, release materials earlier, thus further reducing protective capacity.



Syn: reinforcing loop.
See: cause-effect, current reality tree, future reality tree.

feeding buffer – A time cushion placed between non critical chain work and the critical chain to protect the critical chain, the project's constraint, from variation on a non critical chain path of work.

Usage: The feeding buffer helps determine when to start non critical chain work.

See: buffer management, critical chain.

five focusing steps – A systematic 5-step approach used to continually improve a system's ability to obtain goal units.

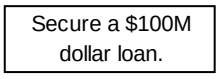
1. IDENTIFY the system's constraint(s).
2. Decide how to EXPLOIT the system's constraint(s).
3. SUBORDINATE everything else to the above decision.
4. ELEVATE the system's constraint(s).
5. WARNING!!!! If in the previous steps a constraint has been broken, go back to step 1, but do not allow INERTIA to cause a system's constraint.

Syn: process of ongoing improvement.

flying pig injection – A breakthrough solution or injection that initially seems impossible to implement.

Perspective: A flying pig injection is so named because it appears to be so difficult to achieve that it has the same near zero probability of occurrence as seeing a flying pig.

Illustration: The securing of a $100 million loan to finance the development of a new, un-patentable product for a 25 year old recent engineering graduate would be considered, by most everyone, to be a flying pig injection.



See: breakthrough injection, injection.

FOL – Abbreviation for fact of life.

free product – A product that does not have any parts/components that require processing time on the constraint.

Usage: When a production system has an active resource constraint, any product/component that is processed on the constraint is done so at the "cost" of some other product that could have been processed. Products that require no constraint time are made without this trade-off or cost, and thus are referred to as "free".

See: constraint.

FRT – Abbreviation for future reality tree.

future reality branch – A sufficiency-based logic tool for examining potential solutions before they are implemented.

Usage: A future reality branch is similar to a future reality tree except that it is used to test and solve problems related to evaluating a specific action or evaporating a cloud. Also, it can result from applying the negative branch reservation process.

See: cloud, future reality tree, negative branch reservation, sufficiency-based logic.

future reality tree (FRT) – A thinking processes sufficiency-based logic tool that facilitates answering the second question in the change sequence, namely, To what to change? The FRT presents a sequence of cause-effect relationships that links the injection(s) to the desired effects (DEs).

Usage: The primary purpose of a FRT is to logically demonstrate that the selected injection, any secondary or supporting injections, and their associated effects will indeed cause the majority of the existing undesirable effects (UDEs) to disappear. An FRT depicts various logical dependencies between the entities resulting from the proposed implementation of a set of injections that are responsible for changing existing UDEs into associated DEs and perhaps, even creating some new DEs.

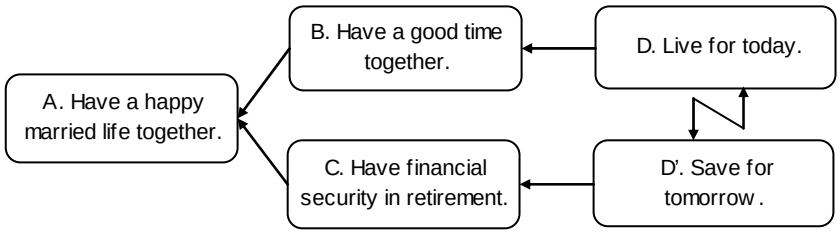
The FRT is constructed prior to implementing any changes in the system. The objectives of the FRT include: (1) to logically demonstrate that the proposed injection(s) will result in a comprehensive and effective solution and, (2) to identify and prevent from occurring any new problems or UDEs that might result from implementing the proposed the injection(s). The latter objective is achieved through the negative branch reservation (NBR) process.

See: change sequence, desirable effects, entity, negative branch reservation, sufficiency-based logic, undesirable effects.

generic cloud – (1) The generalized cloud created in the three-cloud approach. It represents a synthesis of three relatively independent evaporating clouds and contains the core conflict that is responsible for many of the undesirable effects present in an organization or unit of study. (2) A general or basic conflict cloud between two people that represents various underlying day-to-day conflicts.

Examples: Generic clouds include: managing according to the cost world versus the throughput world, local versus global, an individual's well-being versus what is best for system, short-term versus long-term, and, the lieutenant's cloud.

Illustrations: As shown below, a generalized conflict for a married couple might be described as "Live for today versus Save for tomorrow". One of the day-to-day conflicts underlying this generic conflict might be, "Spend money on a fun-filled weekend, versus, do not spend money on a fun-filled weekend". Another one might be, "Buy a boat, versus, do not buy a boat."



See: core conflict, evaporating cloud, lieutenant's cloud, three cloud approach, undesirable effects.

global measurements – Those measurements used to judge the performance of the system as a whole.

Usage: In the throughput-world paradigm of the theory of constraints, throughput (T), investment (I) (formerly referred to as inventory), and operating expense (OE) are global measures.
See: inventory, investment, operating expense, throughput, throughput-world paradigm.

goal – The purpose for which the system was created as determined by the owners of the system.
Usage: In addition to a goal, systems have necessary conditions that must be met or the system will not be able to continue to generate goal units now and in the future.
Example: The owners of most for profit companies identify the goal as "to make more money now and in the future." In addition, they also recognize that it is absolutely necessary that they satisfy their customers now and in the future and that they must provide a secure and satisfying environment for employees now and in the future or they will be unable to reach the goal.
See: necessary condition.

green zone (of the buffer) – The buffer management term for region I, the least critical region of the buffer. Green, a sign of freedom to move/continue, is used to refer to this zone because holes are not a problem in this region of the buffer because parts are generally not supposed to arrive yet or work is not supposed to be completed. Monitoring the green zone will detect early completions that may indicate that the overall size of the buffer can be decreased, or that the rope is not functioning properly
Usage: Theory of Constraints (TOC) logistical solutions in production, project management and distribution use buffers to protect the constraint and the customer from variation. These buffers are broken into three zones generally referred to as the green zone, yellow zone and the red zone. These zones help set priorities in reacting to variation.
Syn: region I.
See: buffer, buffer management, hole, red zone, yellow zone.

hole (in the buffer) – A buffer management term used when a part is due in a specific zone of the buffer but has not arrived or for a stock buffer is not available.
Usage: In operations, a hole in the yellow zone may cause the buffer manager to investigate the situation and, if necessary, plan what action to take if the hole reaches the red zone. A hole in the red zone causes the order to be moved to the front of the queue at each up stream processing step. If necessary, expediting will be done by management.
In critical chain project management there are no holes, instead the term buffer penetration is used.
See: buffer management, critical chain project management, penetration, red zone, yellow zone.

holistic approach – The belief that, because change in one place in a system has ramifications in other parts of the system, in order to find the proper place to focus systemic change, it is necessary to give rigorous consideration to the cause-effect network that links the systems' undesirable effects.
See: cause-effect, undesirable effect.

how to cause the change? – The third question to be answered in the change sequence.

Usage: Typically, the prerequisite tree and the transition tree are the thinking processes logic tools that are used to help determine the plan and detailed actions required to respond to this query.
Perspective: How to cause the change includes, but is not limited to, creating a plan for implementing change. It also includes involving the appropriate people at the appropriate times in the other two steps of the change sequence, as well as facilitating the process of those people creating the solution rather than dictating the required change(s).
See: change sequence, prerequisite tree, transition tree, thinking processes.

I – Abbreviation for investment. (This was formerly used to refer to inventory.)

I-plant – A production environment where materials generally flow through a direct sequence of operations. The logical flow of materials resembles the letter I in the sense that is, there are few divergent points, as in a V-plant, and few convergent points, as in an A-plant.
Examples: Transfer or assembly lines such as used to assemble lawn mowers.
See: A-plant, convergent point, divergent point, V-plant, VATI analysis.

IDD – Abbreviation for inventory dollar days.

identify – The key word in the first step of the five focusing steps: identify the system's constraint(s). It is the process of determining what factor is currently most limiting attainment of the goal.
See: constraint, five focusing steps.

idle capacity – The available capacity that exists on non-constraint resources beyond the capacity required to support the constraint. Idle capacity has two components, protective capacity and excess capacity.
Perspective: Some view all idle capacity as excess capacity or waste that should be trimmed. However, in a system of dependent events and statistical fluctuations, some idle capacity is needed to protect the throughput of the system. TOC refers to this vital part of idle capacity as protective capacity.
Usage: In Theory of Constraints production solution and multi project management, protective capacity is maintained at all non-constraint resources. Increasing protective capacity allows the system to reduce the size of the buffers (thus reducing the lead times of the system) and ensure more reliable on time performance. Reducing variation in the system reduces the need for protective capacity.
See: capacity, excess capacity, productive capacity, protective capacity.

injection – 1. A state or a condition that is proposed as a means for converting undesirable effects into desirable effects through a chain of cause and effect entities in a future reality tree (FRT). 2. A state or condition that invalidates one or more assumptions underlying the relationships between the objective and requirements, or between requirements and prerequisites, or between the two prerequisites of an evaporating cloud. 3. A state or condition that is proposed to overcome, or "trim", a negative branch reservation.
Usage: Although it may be an action, an injection is usually expressed as a system state or condition.

An injection is shown as square cornered rectangle on an FRT.

An injection may involve a breakthrough idea that resolves the core conflict in an evaporating cloud.

In order to verbalize and evaluate an injection, it is not necessary to prove that it is currently possible to achieve the stated condition, that is, the injection may well be a "flying pig injection."

See: breakthrough injection, desirable effects, entity, future reality tree, evaporating cloud, flying pig injection, negative branch reservation, objective, prerequisite, requirement, trimming injection, undesirable effects.

integration point – In project management, the point at which the output(s) of two or more independent chains of work are combined.

Usage: A feeding buffer is required at integration points on the critical chain to protect it from disruptions on the non critical chain tasks.

See: critical chain, critical chain project management, feeding buffer.

interactive constraints – Two or more scarce resources which interact in a way that causes the system's output to be highly unpredictable (chaotic) and/or very difficult to manage.

Usage: When interactive constraints exist, the calculation of throughput per constraint unit is not a valid measure for determining the most profitable product mix.

Background: The complexity of the system is governed, not by the number of constraints, but the number if interactive constraints, which, in turn, is directly related to the difficulty with which one can manage the performance of the system and/or predict system output.

See: constraint, throughput per constraint unit.

intermediate objective (IO) – A transitional condition, or milestone, that must be achieved before a main objective can be attained. IOs usually appear as entities on prerequisite trees and transition trees where they are associated with obstacles that must be overcome before an objective is achieved.

See: entity, objective, obstacle, prerequisite tree, transition tree.

inventory –This used to be one of the operations measurements. It has since been changed to investment.

See: investment (I)

inventory dollar days (IDD) – A measure of the effectiveness of a supply chain that measures whether the supply chain did things that it shouldn't have done, the result of which is that the supply chain is holding inventory of products customers don't want. The system should strive for the minimum IDDs necessary to reliably maintain zero throughput dollar days.

Usage: IDD accounts for the time from when inventory is first put in-stock until it is actually needed by a customer and the monetary value of the inventory being held. IDD is calculated by multiplying the monetary value of each inventory unit in stock by the number of days since that inventory entered the responsibility of that link. The resulting unit of measure is "dollar-days". It is neither monetary nor time based. Attempts to compare dollar-days to other monetary measures are invalid. IDDs can be compared only to other IDD levels.

Example: Consider the IDD for a Part #A243 which has a throughput value of $33. There are currently 144 parts in stock. Of those 144, 50 were added to stock just 2 days ago. Fifty more have been in the bin for 22 days, and the remaining 44 have been in stock for 42 days. The current IDD for Part #A243 is 100,584. ((50x33x2) + (50x33x22) + (44x33x42)).
Syn: inventory value days.
See: throughput dollar days.

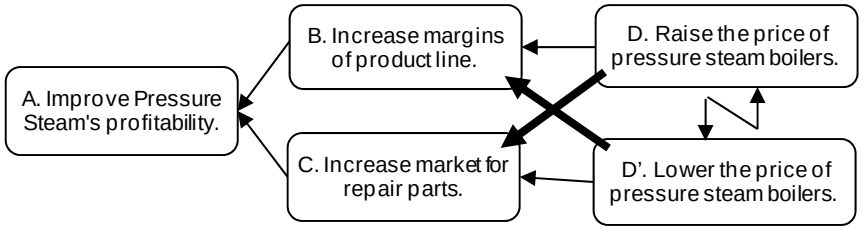
inventory value-days (IVD) – A term used instead of "inventory dollar-days" in countries where the dollar is not the base currency.
See: inventory dollar days.

investment (I) All the money currently tied up in the system. As used in TOC, investment refers to the equipment, fixtures, buildings, etc. that the system owns as well as inventory in the forms of raw materials, work in progress, and finished goods.

IO – Abbreviation for intermediate objective.

IO map – A necessity-based logic diagram containing injections, intermediate objectives, and the final objective, or ambitious target. The IO map is made from a prerequisite tree by removing all the entities representing obstacles.
Usage: An IO map is frequently created prior to building a project network.
See: intermediate objective, prerequisite tree.

jeopardy – One of three checks that is performed to test the validity of an evaporating cloud (EC). It checks whether entity D jeopardizes the requirement stated in entity C as well as whether entity D' jeopardizes the requirement stated in entity B.
Usage: If jeopardy is not present between the entities, then the wording in one or both entities needs to be revised.
Perspective: A valid EC must also meet the following two other conditions: (1) entities D and D' must be in conflict with each other; (2) entities B and C must not be in conflict with one another.
Illustration: Does the existence of, "D. Raise the price of Pressure Steam Boilers," jeopardize the existence of, "C. Increase market for repair parts"? The answer is yes because raising the price of boilers will reduce sales of boilers and reduced sales means fewer boilers in use that might require repair parts. Does the existence of, "D′. Lower the price of pressure steam boilers," jeopardize the existence of, "B. Increase margins of product line"? The answer is yes because, assuming costs have not decreased, margins will go down when the price is lowered. (Reference: It's Not Luck, Goldratt, 1994).



See: entity, evaporating cloud, requirement.

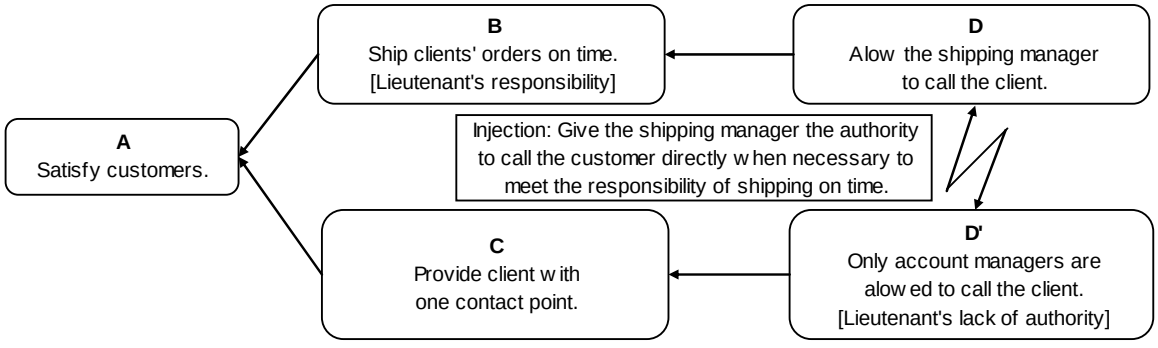
layers of resistance – A six part stratification of the concept in organizational behavior that is often identified as "resistance to change".
The six layers of resistance, as expressed by the person(s) resisting change, are:
1. Disagree on the problem
2. Disagree on the direction of the solution.
3. Disagree that the solution solves the problem.
4. Yes, but there are potential negative consequences.
5. Yes, but there are obstacles to implementing the solution.
6. Un-verbalized fears.

Perspective: Properly understood what is thought of as "resistance" actually becomes the greatest force for managing organizational change by using the TOC tools, particularly the thinking processes, to systematically overcome each layer and obtain buy-in.
See: buy-in.

leverage point
Syn: constraint.
See: constraint.

lieutenant's cloud – An evaporating cloud that describes the conflict that an employee has relative to the misalignment of his/her responsibility and authority.

Usage: In this story line, the company has experienced problems in the past when multiple people inside the company speak directly to the customer. A policy was established that only the account manager can speak with the customer. It happened, however, that the account manager was not available when the shipping manager needed to ask the customer's question about an order that needed to ship immediately or it would be late. The shipping manager (the "lieutenant") was responsible to ship the order on time but lacked the authority to contact the customer in order to get the information needed to fulfill his/her responsibility. As shown in the cloud below, the injection (as shown in the square-cornered box) to evaporate this cloud is giving the lieutenant the authority to contact the customer when it has a direct impact on his/her ability to fulfill the responsibility of shipping on time.
Illustration:



See: alignment of responsibility and authority, evaporating cloud, injection.

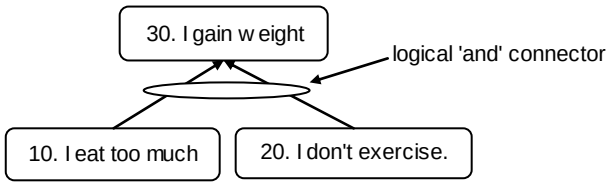
logic branch
See: logic twig.

logic diagram
Syn: logic tree, tree diagram.
See: logic tree.

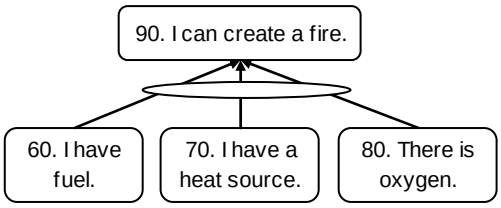
logic tree – A graphical representation of cause-effect relationships consisting of entities connected by arrows and using either sufficiency- or necessity-based logic.
Usage: Small logic trees are sometimes referred to as logic branches or twigs, especially when excerpted from a larger tree.
Syn: tree diagram, logic diagram.
See: current reality tree, entity, future reality tree, necessity-based logic, negative branch reservation, prerequisite tree, sufficiency-based logic, transition tree.

logic twig – Several entities connected together using sufficiency-based logic relationships.
Usage: Generally, a logic twig is a subset or selected portion of a logic tree that has more entities.
Syn: logic branch.
See: entities, sufficiency-based logic.

logical 'and' connector – A symbol shaped like an ellipse used in thinking processes sufficiency-based logic diagrams to indicate that all entities whose exiting arrows are encompassed by the logical 'and' connector must exist in order for the effect to exist.
Usage: The logical 'and' connector is used in the following logic diagrams: the current reality tree, future reality tree, negative branch reservation, and transition tree. The ellipse is drawn across the arrows from two or three entities to denote that they all must exist if the designated effect is to occur. In other words, removal of any one of the causes grouped by the ellipse precludes the indicated effect from occurring.
Illustration#1: The following logic diagram is verbalized, "If, 10. I eat too much, and if, 20. I don't exercise, then, 30. I will gain weight."



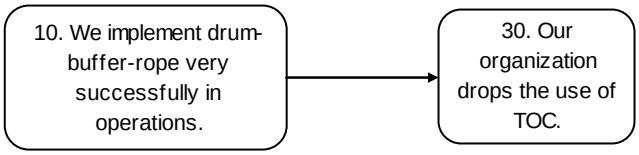
Illustration#2: "If, 60. I have fuel, and if, 70. I have a heat source, and if, 80. There is oxygen, then, 90. I can create a fire." If any of these three conditions do not exist, then the fire cannot be started.



Syn: conceptual 'and' connector, 'and' connector, ellipse, banana (slang).
See: current reality tree, entity, future reality tree, logic tree, negative branch reservation, sufficiency-based logic, transition tree.

long arrow – a term used when scrutinizing a logic diagram to indicate that there appears to be a gap in the logic that leaves it unclear how a cause and effect are related.

Illustration: When seeing the following two entities, the scrutinizer might say, "I don't see how implementing drum-buffer-rope very successfully causes the organization to drop the use of TOC. That is a 'long arrow' for me." The scrutinizer is saying that there must be additional entities between 10 and 30 before he/she can understand the cause-effect logic.



Syn: trans-Atlantic arrow.
See: scrutiny.

management constraint – A common misnomer. Management is not really the constraint, rather poor management hinders effective constraint management by inhibiting the ability to fully exploit and/or subordinate to the constraint.

Illustration: Management may punish engineers for not finishing their project tasks on time. The effect is that engineers put more "safety" in their estimates of task times, and early finishes are rarely reported. The unintended negative consequence is that the project's critical chain is not exploited and projects almost always finish late in spite of all the safety built into every task estimate. Bad actions by management that punish project engineers are not the constraint, but it hinders the engineers' ability to exploit the constraint of the project.
Note: In the past poor management was commonly referred to as a type of constraint.
See: constraint, exploit, subordinate.

market constraint – The condition wherein the market demand is less than the organization's capacity to deliver its product(s) or service(s). Insufficient customer demand is the constraint of the company.

See: constraint.

material constraint – Usually a misnomer. Material shortages are rarely the constraint, rather temporary material shortages hinder effective constraint management by inhibiting the ability to fully exploit and/or subordinate to the constraint.

Perspective: Material does, at times, become difficult or impossible to get, such as the world wide steel shortages in the early 21st century. In that situation, steel was the constraint for a period of time. But, in most cases, material temporary shortages are temporary – or material is available from another supplier and/or at a higher price. So material shortage is rarely considered to be the constraint, rather it hinders effective constraint management by inhibiting the ability to fully exploit and/or subordinate to the constraint.
See: constraint, exploit, subordinate.

measures constraint – A common misnomer. Bad measures are not the constraint. Rather, bad measures hinder effective constraint management by inhibiting the ability to fully exploit and/or subordinate to the constraint.
Illustration: Measuring efficiency at all resources drives overproduction at non-bottleneck resources and leads to starvation of the bottleneck. The efficiency measures are not the constraint, they are not what should be exploited and subordinated to; rather, they are blocking the system's ability to exploit and subordinate properly to the constraint.
Note: In the past measurements were commonly referred to as a type of constraint.
See: constraint, exploit, subordinate.

most penetrating chain – The chain of work that is not on the critical chain, yet it is currently extends farther into the project buffer than any other chain of work. The most penetrating chain includes the non-critical chain work and the remaining work on the critical chain once the chain intersects into the critical chain.
Usage: It is undesirable in critical chain project management if the buffer burn rate is greater than 1.0. If this happens management must do whatever it can to reduce the time it takes to complete the tasks on this chain and make the ratio less than 1.0, thereby making the original critical chain the longest chain remaining.
See: buffer burn rate, critical chain, critical chain project management.

multitasking – Stopping work on a task before it is completed in order to start work on another task.
Usage: Multitasking itself is neither bad nor good. Bad multitasking occurs when switching tasks does not help any project finish earlier.
Illustration: In a multi project environment it is common for resources to be required to switch between tasks on various projects (or within the same project) in order to show progress. Such multitasking usually extends the duration of all projects and, therefore, is bad multitasking. If, however, a resource is forced to stop a task on one project in order to complete a task that is delaying the critical chain or the most penetrating chain on another project, thereby helping that project to finish earlier, it is usually considered good multitasking.

Murphy – A reference to unplanned variation in a system. Murphy's Law states that if anything can go wrong it will.
Usage: Murphy includes unplanned variation caused by machine breakdowns, poor quality, materials delayed due to a transportation problem, etc. Buffers are used to protect against Murphy.

See: assembly buffer, buffer, capacity buffer, drum buffer, feeding buffer, project buffer, shipping buffer, statistical fluctuations and dependent events, stock buffer, time buffer, space buffer.

NBR – Abbreviation for negative branch reservation.

necessary condition – A requirement which must exist in order to achieve the goal or reach an intermediate objective.

Usage: Necessary conditions are found on prerequisite trees and evaporating clouds.

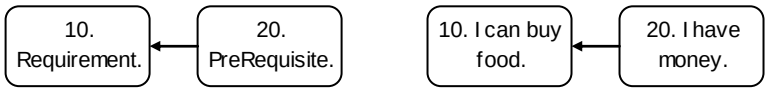
Example: The goal of most for-profit companies is to make more money now and in the future. In order to reach that goal it is absolutely necessary that the company simultaneously satisfy its customers and provide a secure and satisfying environment for its employees.

See: evaporating cloud, intermediate objective, prerequisite tree, requirement.

Necessity-based logic – A type of logic in which each entity at the tail of an arrow must exist in order for the entity at the head of the arrow to exist.

Usage: The TP diagrams that use this type of logic are the evaporating cloud and the prerequisite tree. The validity of the connections is scrutinized by questioning the validity of the assumptions underlying the relationship between the two entities.

Illustration: Necessity-based logic diagrams are read beginning with the entity at the point of the arrow as follows. The generic necessity-based logic diagram on the left is verbalized, "In order that, 10. Requirement, it is necessary that, 20. Prerequisite." The example on the right is verbalized, "In order that, 10. I can buy food, it is necessary that, 20. I have money."



See: assumption, entity, evaporating cloud, prerequisite tree, scrutiny.

need

Syn: necessary condition, requirement.

See: necessary condition.

negative branch reservation (NBR) – An adverse or undesirable side effect that can be caused by an injection and thereby compromise the positive effects from a proposed problem solution or injection.

Usage: Documented as a future reality branch, the resultant new set of cause-effect entities progresses from an injection to one or more new undesirable effects (UDE). NBRs, if valid, require an additional or secondary injection at the point where the tree branch starts turning negative in order to eliminate the negative outcome. The process of adding a secondary injection is called trimming the negative branch. If the new UDE is significant, and a satisfactory trimming injection is not derived, the original injection must be re-examined.

See: desirable effect, entity, future reality branch, injection, secondary injection, undesirable effect.

negative branch reservation process – A method that uses sufficiency logic to show that implementing a proposed injection may lead to one or more new undesirable effects.
Usage: The negative branch reservation process involves the creation of one or more future reality branches.
See: negative branch reservation.

net profit (NP) – An absolute measure of financial performance which is calculated as the difference between revenues and expenses. In throughput accounting, net profit is calculated as throughput minus operating expense.
See: operating expense, throughput, throughput accounting.

non-bottleneck resource – Any resource whose capacity is greater than the demand placed on it.
Usage: TOC claims that providing non-bottleneck resources with sufficient protective capacity is necessary to protect the throughput of the system.
See: bottleneck resource, protective capacity, throughput.

obstacle – Something that blocks or prevents a desirable system condition, state of being, or desired action from occurring.
Usage: Obstacles are usually determined by the builder of a prerequisite tree as she/he anticipates possible blockages or complications in implementing an injection to reach a desired effect or ambitious target. Overcoming an obstacle requires the identification and achievement of an intermediate objective.
See: ambitious target, desirable effect, injection, prerequisite tree, intermediate objective, thinking processes.

OE – Abbreviation for operating expense.

operating expense (OE) – All the money the organization spends in generating "goal units".
Perspective: In the throughput-world paradigm of the theory of constraints, operating expenses include items such as salaries, rent, insurance, and other expenses that would be paid even if operations stopped for awhile. OE does not include expenses that vary directly with production/service volume, such as cost of raw material, commissions, etc. These expenses are considered to be totally variable costs, not OE.
See: global measures, throughput-world paradigm, totally variable costs.

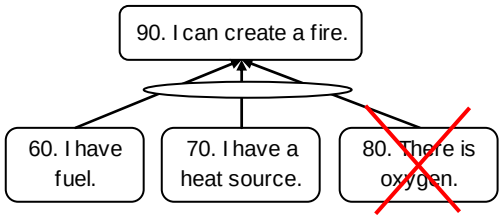
operational measurements – Those measures that correctly link the impact of decisions made in day-to-day operations to global impact.
Usage: In the throughput-world paradigm of the theory of constraints, the global measures of throughput, investment, and operating expense also serve as effective operational measures. This is because local decisions that have a positive impact on T, I, and/or OE will also have a positive impact on net profit, return on investment, and/or cash flow.
See: global measures, investment, operating expense, throughput, throughput-world paradigm.

order lead time – The time from when a product is sold until an order is placed to replace the product.

Usage: Order lead time, production lead time, and transportation lead time are the three components of replenishment time.
See: production lead time, replenishment time, transportation lead time, supply lead time.

over activation – Activating a resource more than is required to keep pace with the constraint under normal circumstances, or, after a system disturbance, more than is required to rebuild the bank of materials in front of the constraint.
Example: If a resource that has a capacity of 7 hours a shift and normally has to produce 5.5 hours of output to keep up with the constraint, producing more than the required 5.5 hours of output is usually over activation. The exception is when a disruption has occurred and more than 5.5 hours of output are required to rebuild the bank of materials in a downstream buffer.
See: buffer, constraint.

oxygen – An assumption that is usually not documented on a thinking processes sufficiency-based diagram because it is known by all to exist and accepted as an element of reality everywhere.
Illustration: The following logic diagram is verbalized, "If, 60. I have fuel, and if, 70. I have a heat source, then, 90. I can create a fire." I also need oxygen, but oxygen is everywhere we are, so we usually assume oxygen is available and it is not necessary to document it on our sufficiency-based logic diagram.



See: assumption, fact of life, sufficiency-based diagram, thinking processes.

parallel assumption – A factor used in the development of a strategy and tactics tree that shows why tactics are necessary and how they lead to a strategy to being met.
Usage: A parallel assumption answers the following two questions: 1. Why the strategy will not happen by itself (why do we need to take an action); and, 2. Why do we claim that the tactics stated will achieve the strategy? It may also help explain why this particular tactic to achieve the strategy is better than other alternatives that have been considered.
See: strategy and tactics tree.

penetration (of the buffer) – A buffer management term used in critical chain project management when a task or chain of tasks is not complete and the total elapsed time is longer than the (cumulative) estimated time(s). When this occurs, the expected completion time extends into, or penetrates, the associated buffer.
Usage: Penetration in the yellow zone causes the buffer manager to investigate the situation and, if necessary, plan what action to take if penetration reaches the red zone. If the penetration, or hole, reaches the red zone it causes the order to be moved to the front of the queue at each up stream processing step. If necessary, expediting will be done by management.

In critical chain project management, buffer burn rate is used to judge whether the buffer penetration is serious enough to require action.
See: buffer, buffer burn rate, buffer management, critical chain project management, hole, red zone, yellow zone.

piece buffer
See: stock buffer.

PMBs – Abbreviation for policies, measurements, and behaviors.

policies, measurements and behaviors (PMBs) – A series of three entities documenting the cause-effect relationship between a system's policy, its measurement, and the resulting organizational behavior.
Perspective: Frequently, an obsolete or ineffective policy and some associated metrics for monitoring its enforcement results in dysfunctional behavior within a system. Since, this sequence of entities often is responsible for one or more undesirable effects, it is important to document it in the current reality tree for the organization.
Example: Based on the assumption that increased local efficiency is desirable, the (informal) policy exists which seeks to keep employees busy all the time because it is believed that will reduce product costs. The metrics involved are local efficiencies and resource utilization. The behavior created is that work is released early to production, and the resulting undesirable effects include excess work-in-process and finished goods inventories, poor due date performance, low cash position, etc.
See: cause-effect relationship, current reality tree, entity, undesirable effect.

policy constraint – A common misnomer. Bad policies are not the constraint, rather they hinder effective constraint management by inhibiting the ability to fully exploit and/or subordinate to the constraint.
Illustration: Many manufacturers have a policy to build parts in an "economic order quantity", which usually means to build in large batches in an effort to save costs. Building in large batches can cause periodic starvation of the constraint. Note that when this happens, the bad policy is not the constraint, rather it is inhibiting the ability to fully exploit the constraint.
Note: In the past policies were commonly referred to as a type of constraint.
See: constraint, exploit, subordination.

POOGI – Abbreviation for process of ongoing improvement.

positive branch – A set of cause-effect entities that are diagramed as a future reality branch showing how an injection leads to a new desirable effect.
Perspective: A positive branch may be contrasted with a current reality branch or a negative branch.
See: current reality branch, desirable effect, entity, future reality branch, injection, negative branch reservation, negative branch reservation process, undesirable effect.

PQ problem – A simple production case study used to illustrate the impact of financial measures on decision making. In this case study the company produces only 2 products and demand

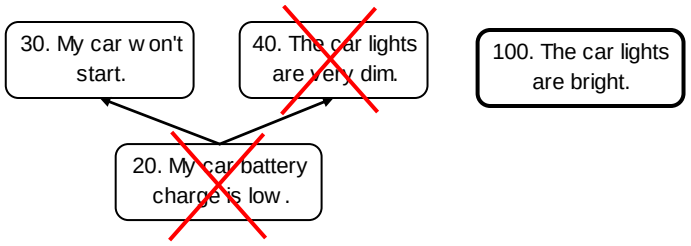
exceeds capacity so that there is one active internal constraint. Conventional per-unit financial measures of sales revenue, labor costs, and gross margin all favor product Q. Yet if management, relying on these measures, decides to favor product Q in the market, the company will lose money; whereas if they favor product P they will make money. This problem illustrates that failure to identify and properly exploit a constraint can have a significant negative impact on the bottom line.

See: constraint, exploit.

predicted effect reservation – A Level III reservation in the categories of legitimate reservation that is used to challenge an entity's existence and/or the existence of a causal relationship on the basis of the absence of an inevitable effect that would have to exist if the entity or the proposed causal relationship really existed.

Usage: Predicted effect can be used to prove or disprove the existence of an entity or a cause-effect relationship that is very difficult, perhaps even impossible to prove by direct observation. On one hand, if everyone agrees that the if the entity (cause) in question exists, then another entity (predicted effect) must also exist, then if the scrutinizer shows that the predicted effect does not exist, then the cause can not exist. On the other hand, if the predicted effect does exist, then the existence of the original cause is supported.

Illustration: The existing effect is, "30. My car won't start." The proposed cause is, "20. My car battery charge is low." Another predicted effect of a low battery charge is, "40. The car lights are very dim." If testing the lights shows that, "100. The car lights are bright," then the car battery charge must not be low. Conversely, if the lights were indeed very dim, then support would be given to the existence of the cause that the car battery charge is low.

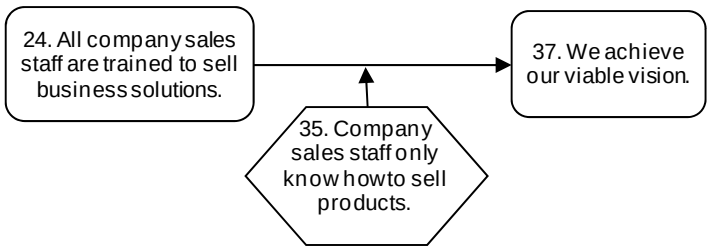


See: categories of legitimate reservation, cause-effect, entity, scrutiny.

prerequisite tree (PRT) – A necessity-based logic diagram that facilitates answering the third question in the change sequence, namely, how to cause the change? A PRT shows the relationship between the injections, intermediate objectives, or ambitious target, and the obstacles that block the implementation of the injections. A PRT includes the intermediate objectives required to overcome the obstacles, and shows the sequence in which they must be achieved for successful implementation.

Usage: A PRT and/or an IO map (which is derived from a PRT) are used to plan the sequence of actions that must be taken to achieve an ambitious target.

Illustration: The following portion of a PRT is verbalized, "In order that, 37. We achieve our Viable Vision, it is necessary that, 24. All company sales staff are trained to sell business solutions, because we are currently blocked by the obstacle, 35. Company sales staff only know how to sell products."



See: ambitious target, desirable effect, injection, intermediate objective, necessity-based logic, IO map, thinking processes.

process batch – The quantity or volume of output that is to be completed at a workstation before switching to a different type of work or changing an equipment set-up.

Usage: In batch and queue environments production lead time can often be shortened significantly by setting the transfer batch size smaller than the process batch.

See: production lead time, transfer batch.

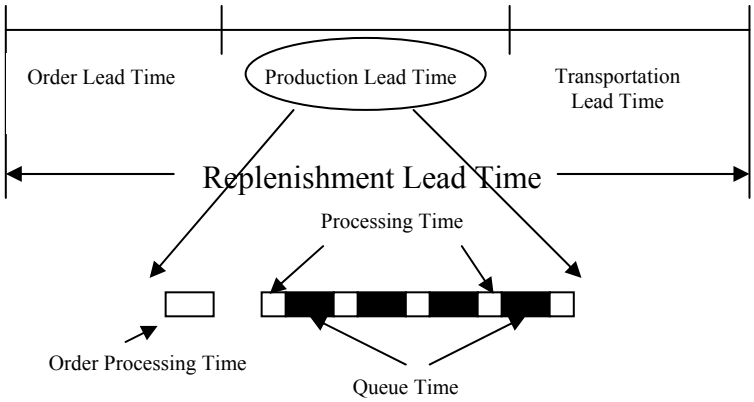
process of ongoing improvement (POOGI)

Syn: five focusing steps.

See: five focusing steps, change sequence.

production lead time – The total time from when an order is received until the order is ready for shipment.

Illustration: Production lead time is made up of 3 elements: order processing time, queue time (the summation of all the time the order waits to be processed), and the processing time summed for all resources.



See: order lead time, replenishment lead time, transportation lead time, supply lead time.

productive capacity – Resource capacity that is required to produce output sufficient to satisfy the demand of the constraint.

Perspective: Resource capacity is divided into three types: productive, protective, and excess. While some believe that all capacity beyond productive capacity is waste, TOC claims that some protective capacity is needed at non constraint resources in order to protect the throughput of the system.

See: excess capacity, protective capacity, waste.

project buffer – A time cushion placed at the end of the project to protect against variation in the time it takes to complete tasks on the critical chain.

Usage: The project buffer is not formed by simply adding time to the end of the existing project network. Rather, safety time is removed from individual task time estimates of the activities on the critical chain. Half of this removed safety time is placed strategically at the end of the critical chain in a project schedule to protect the overall schedule. The project buffer will be penetrated, or depleted, when tasks on the critical chain take longer than estimated and/or after a feeding buffer has been used up and there is still time required to complete some task(s) on the associated non-critical chain.

A simple rule of thumb is that the project buffer is one-half the length of the critical chain.

Syn: completion buffer.

See: critical chain, feeding buffer.

protective capacity – Resource capacity needed to protect the throughput of the system by ensuring that some capacity above the capacity required to exploit the constraint is available to catch up when disruptions inevitably occur. Non-constraint resources need protective capacity to rebuild the bank in front of the constraint or capacity constrained resource (CCR) and/or on the shipping dock before throughput is lost.

Usage: Disruptions are the result of such things as normal variation in process times, unplanned downtime, late deliveries from suppliers, etc. Protective capacity is also called "sprint" capacity. Some practitioners believe that constraints/CCRs also need protective capacity so that "positive" uncertainty in the form of unexpected demand for more product/service by a key customer/market can be accommodated in the short term. Protective capacity is also required for the same reasons in a multi project environment. If there is not enough protective capacity within a multi project environment, variation can have a significant impact on the ability to complete the critical chain on time and keep the project on time. Lack of protective capacity can also disrupt the ability to maintain the drum schedule.

See: capacity constrained resource, constraint, critical chain, drum schedule, exploit, throughput.

raw material buffer – A stock of raw materials that provides instant availability to a gateway process.

Usage: In some instances the lead time to get raw materials is too long to be reactive to market demands. In these instances a raw material buffer can be held at or near the plant to ensure that key materials and/or long lead time raw materials are available when needed.

See: buffer, stock buffer.

red zone (of the buffer) – The buffer management term for region III, the most critical region, of the buffer. Generally, parts are supposed to arrive or work is supposed to be completed before the green zone. Red, a sign of danger or urgency, is used to refer to this zone/region because any hole in the red zone signifies that future throughput is in jeopardy as there is a risk that the part will not be available when needed. A hole in this region requires immediate action as determined by the buffer management process.

Syn: region III

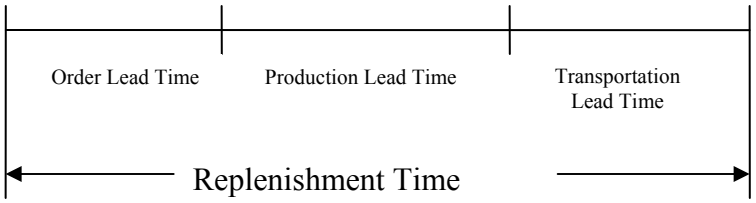
See: buffer, buffer management, green zone, hole, yellow zone.

reinforcing loop
See: feedback loop.

relay runner – The process of applying a focused effort to complete a task and hand it off immediately to a resource waiting and prepared to take the hand-off in critical chain project management.
Usage: Some people use relay runner interchangeably with road runner in an operations environment.
Syn: road runner work ethic.
See: road runner work ethic.

replenishment frequency – The number of times a product is replenished per time-unit, for example, once a day, or twice a week.

replenishment time – The time it takes from when a product is sold until a replacement is available at the point of sale/use.
Illustration: Replenishment time is the sum of three temporal components: order lead time; production lead time; and transportation lead time.



See: order processing time, production lead time, stock buffer, supply lead time, transportation lead time.

resource buffer – A warning mechanism used in single project environments to ensure that resources working on a critical chain task are available when needed.
Usage: A resource buffer is sized based on the level of warning that is needed in the environment. The resource buffer not only prevents delays in the critical chain that would occur if a resource were not available when needed, it improves the chances of taking advantages of early finishes. Resource buffers do not add time to the project lead time.
See: critical chain.

return on investment (ROI) – A relative measure of financial performance which provides a means to compare various investments by calculating the profits returned over a specified time period. In TOC, ROI is calculated as throughput minus operating expense divided by investment.
See: investment, operating expense, throughput.

roadrunner work ethic – The work rules in the drum-buffer-rope or critical chain project management (CCPM) systems. The rules are: if there is work available start it immediately; if there is more than one work-order/task in queue choose the one with the highest system-priority;

work at full speed without stopping until the work is completed; produce zero defects and pass the work on immediately; if there is no work available stay idle.

Perspective: The name roadrunner comes from a popular cartoon character that had only one speed: the roadrunner would move at full speed until he reached his objective, then he came to a full stop.

See: relay runner.

root cause – An entity usually appearing at the lowest level of causality within a current reality tree for which there are no postulated causes. It is a starting point for a reality branch that leads to one or more undesirable effects (UDEs).

Usage: If a root cause results in the majority of the UDEs including the most significant ones, it may be labeled as the core problem. When a root cause is eliminated, the recurrence of one or more UDEs will be prevented. In contrast to a core driver, a root cause is a state or condition over which a manager has some degree of influence or the capability to change.

Perspective: Root cause, as used here, is different than the identical term when associated with the TQM paradigm where brainstorming and creating a fishbone/Ishikawa diagram or producing an interrelationship digraph yield the cause responsible for a defined problem within a process being improved.

Syn: core problem.

See: causality, core driver, core problem, current reality tree, entity, undesirable effect.

rope – One of the three devices required for proper management of operations. (The other two are drum and buffer.) The rope is the information flow from the drum to the beginning of the process which restricts the release of materials to match the flow though the constraint.

See: buffer, drum, drum-buffer-rope.

S&T – Abbreviation for strategy and tactics tree.

scrutiny – The process of conducting a rigorous inspection of a thinking processes logic tree or diagram using the categories of legitimate reservation as a framework for raising questions about the diagram's structure and the content contained within any of the entities or group of entities.

Usage: A person that scrutinizes a logic diagram is called a scrutinizer.

See: categories of legitimate reservation, entity, logic tree, thinking processes.

S-DBR – Abbreviation for simplified drum-buffer-rope.

secondary injection

Syn: trimming injection.

See: injection, trimming injection.

shipping buffer – One of the time cushions used in drum-buffer-rope (DBR) to protect the shipping date of finished goods. In DBR, the shipping buffer is used to establish the constraint schedule and the release schedule for raw materials that do not go through the constraint or assembly buffers. In simplified drum-buffer-rope, the shipping buffer is the only buffer used.

Usage**:** Buffer management is used to identify the holes in the shipping buffer and the cause(s) of these holes as part of the process of ongoing improvement.

See: buffer, drum-buffer-rope, process of ongoing improvement, simplified drum-buffer-rope.

simplified drum-buffer-rope (S-DBR) – The process of managing operations based upon a shipping buffer, a market drum and secondary attention to any capacity constrained resources.
Usage: S-DBR can be used in a production system when the market is the constraint. It only uses one type of buffer, namely, the shipping buffer.
See: capacity constrained resource, drum, shipping buffer.

space buffer – Physical space immediately after the constraint that can accommodate output from the constraint when there is a stoppage downstream that would otherwise force the constraint to stop working.
Usage: A space buffer can also be used in front of the constraint to hold the bank of materials that builds up there to reduce the chances that the constraint will run out of work to process.
See: constraint.

sprint capacity
See: protective capacity.

statistical fluctuations and dependent events – Two realities present in any operations or project management system that has more than one component. The co-existence of these two factors is what necessitates the elements of the drum-buffer-rope or critical chain project management solutions for managing these systems.
See: critical chain project management, drum-buffer-rope.

stock buffer – A quantity of physical inventory held in the system to protect the system's throughput.
Perspective: Stock buffers should not be confused with time buffers such as the constraint or shipping buffers.
Syn: piece buffer
See: buffer, throughput.

strategic selection of the constraint – The five focusing steps are not intended to be used as an infinite loop whereby an organization identifies and eliminates the current constraint over and over again. Rather, top management should determine where to move and hold the constraint with the intent of optimizing the organization's strategic ability to achieve its goal. Over time, of course, changes in markets, technology, etc. may cause organizational leaders to strategically move the chosen constraint.
See: constraint, five focusing steps.

strategy and tactic tree (S&T) – A logic diagram that includes all the entities and their relationships that are necessary and sufficient to achieve an organization's goal. The purpose of the S&T tree is to surface and eliminate conflicts that are manifested through the misalignment of activities with organizational goals and objectives.
Usage: Organizational strategy specifies the direction of the activities that purport to address longer range problems and issues. Tactics are the specific activities needed to achieve the strategic objective involved in implementing organizational strategies. Since strategy and

tactics exist and must be synchronized within various organizational levels, this logic tree translates high level strategy down to the level of day-to-day operations.
See: entity, logic diagram.

student syndrome – Failing to start a task, even though the start date has passed, because there appears to be plenty of time before the seemingly distant due date. The name is derived from the fact that most students tend to behave in this manner when given long range assignments.
Perspective: This behavior wastes any protection the task had available and accounts for the fact that in a conventional project environment, tasks - even though they typically contain lots of safety - tend to be completed rarely before, often close to, and frequently after the due date.
Usage: Typically other things appear to be more important, leading resources to delay starting or finishing work on a task. Once the due date becomes near, the effort increases to complete the task on time, however, any variation causes the task to be late. The student syndrome is one of the behaviors that critical chain project management seeks to eliminate.
See: critical chain project management.

subordinate – The key word in the third of the five focusing steps: subordinate everything else to the above decision. Subordination is vital to achieve full exploitation of the constraint. Subordination has two major components: 1. all non-constraint resources must be managed to ensure that the constraint always has exactly what it needs when it needs it; and, 2. all non-constraint resources are not allowed to process work beyond what is required for the constraint.
Illustration: In the case of an internal resource constraint, non-bottleneck resources should ignore such things as local efficiency and run smaller batches in order to ensure that the constraint does not starve.
See: bottleneck, constraint, five focusing steps.

sufficiency-based logic – A type of cause-effect reasoning in which the existence of one or more stated causes leads unavoidably to the existence of the stated effect.
Usage: The thinking processes diagrams that use this type of if…, then… (cause-effect) logic are the current reality tree, future reality tree, negative branch reservation, and transition tree.
Illustration 1: Sufficiency-based logic diagrams are read beginning with the entity at the beginning of the arrow. The following logic diagram is verbalized, "If, 10. I default on a loan, then, 20. My credit rating goes down."

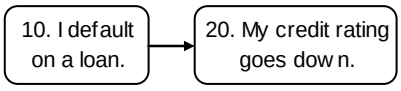
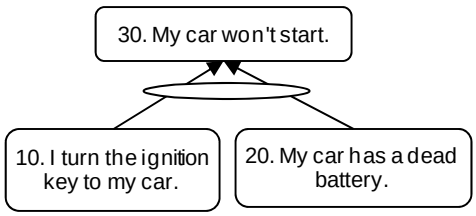


Illustration 2: Sometimes one cause is not sufficient to explain the existence of the observed effect. In such cases two or more causes are diagramed and linked with a logical 'and' connector (or ellipse). The following logic diagram is verbalized, "If, 10. I turn the ignition key to the car, and if, 20. My car has a dead battery, then, 30. My car won't start."



See: cause, cause-effect, effect, entity, logical 'and' connector, thinking processes.

supply lead time – The time lapse between when an order is received and when the product is available on the shelf for sale. Supply lead time, a portion of replenishment lead time, has two components: production lead time and transportation lead time.
See: production lead time, replenishment lead time, transportation lead time.

synchronized production
See: drum-buffer-rope.

synchronized supply chain – A supply chain where each link invests all the resources necessary (and only the amount of resources necessary) to maintain and properly protect the throughput of the system.

T – Abbreviation for throughput.

T-plant – A production environment characterized by initial straight line flow followed by divergent final assembly points. The logical network of material flow resembles the letter T in the sense that all materials go through similar processing until the final steps diverge to create a relatively large number of different end products.
Examples: Car assembly, and faucet manufacturing.
See: VATI analysis, divergent.

TA – Abbreviation for throughput accounting.

T/CU – Abbreviation for throughput per constraint unit.

TDD – Abbreviation for throughput dollar days.

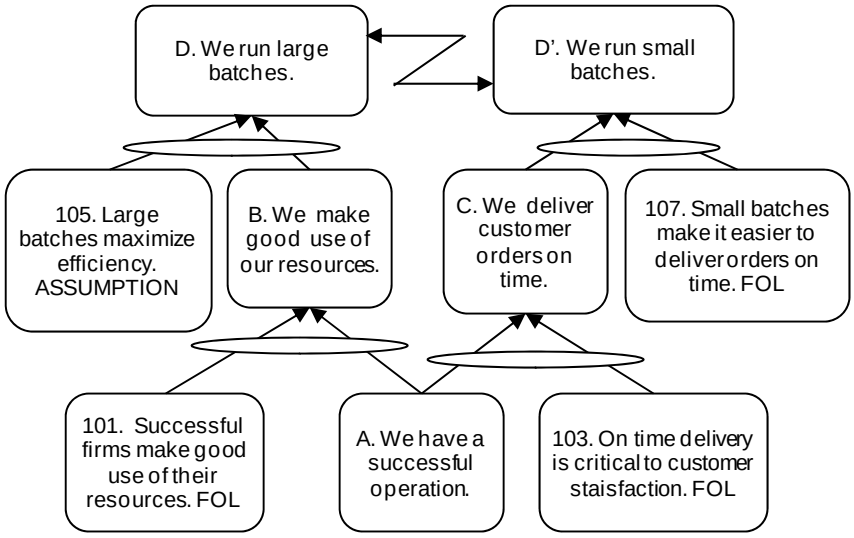
temporary bottleneck – A situation created when the demand for a specific resource exceeds its capacity for a short period of time.
See: bottleneck.

theory of constraints (TOC) – A holistic management philosophy developed by Dr. Eliyahu M. Goldratt that is based on the principle that complex systems exhibit inherent simplicity, i.e., even a very complex system made up of thousands of people and pieces of equipment can have in any given time only a very, very small number of variables – perhaps only one (known as a constraint) – that actually limits the ability to generate more of the system's goal.
Syn: constraint management.
See: constraint, goal, holistic approach.

theory of constraints accounting
See: throughput accounting.

thinking processes (TP) – A set of logic tools that can be used independently or in combination to address the three questions in the change sequence, namely, 1. What to change? 2. To what to change? And, 3. How to cause the change? The TP tools are: evaporating cloud, current reality tree, future reality tree, negative branch reservation, prerequisite tree, and transition tree.
Usage: The TP logic tools can be used to overcome the layers of resistance and achieve buy-in from various stakeholder groups.
See: buy-in, change sequence, current reality tree, evaporating cloud, future reality tree, layers of resistance, logic tree, negative branch reservation, prerequisite tree, transition tree.

three-cloud approach – A relatively fast method of developing a current reality tree (CRT) wherein the developer identifies three seemingly independent undesirable effects (UDEs), creates an evaporating cloud (EC) for each, and synthesizes the three ECs into a single generic cloud called the core conflict cloud (CCC).
Usage: Along with surfaced assumptions underlying each of the entity pair relationships (A-B, A-C, B-D, C-D' and D-D') in the EC, this approach uses the CCC to form the base for a CRT by, 1. a 90 degree rotation, 2. some small wording changes in the entities, 3. reversing the direction of the arrows, and 4. adding some assumptions to provide sufficiency and tightness to the logic. Finally, to complete the CRT, the developer often needs to include a transitional entity using various facts of life entities, and build logically upward to the UDEs for the system being analyzed and improved.
Illustration: The base of a CRT that has resulted from using the three-cloud approach is shown below.



See: core conflict cloud, core driver, current reality tree, evaporating clouds, transitional entity, undesirable effects.

three-minute egg rule – An expression applied to a task that has no variation in its task duration and must take the full scheduled time to be of high quality or meet the required time.

Usage: This is typical of certain tasks in project environments. For example, a 1000 hour run-time test is not complete until you have run the test 1000 hours.

throughput (T) – The rate at which the system generates "goal units". Because throughput is a rate, it is always expressed for a given time period such as per month, week, day or even minute. If the goal units are money, throughput will be an amount of money per time period. In that case throughput is calculated as revenues received minus totally variable costs divided by the chosen time period.

Illustration: Suppose a company produces only one product, and it sells for $100 and has totally variable costs of $35 per unit. If, in a week, the company produces 500 units but only sells 450, throughput would be $29,250 per week ((100-35) x 450). NOTE: Product produced but not sold does not generate throughput, it increases inventory.

See: inventory, throughput, totally variable costs.

throughput accounting (TA) – A management accounting method that is based on the belief that because every system has a constraint which limits global performance, the most effective way to evaluate the impact that any proposed action will have on the system as a whole is to look at the expected changes in the global measures of throughput, investment and operating expense.

See: constraint, global measures, investment, operating expense, throughput.

throughput dollar days (TDD) – A measure of the reliability of a supply chain, that is, did the supply chain deliver everything it said it would. The system should strive for zero throughput dollar days.

Usage: TDD considers the monetary value of the things a link is committed to deliver but does not, and the number of days by which the link misses the commitment. TDD is the summation of the commitments not delivered on time during the chosen time period. The TDD value of individual missed commitments is calculated by multiplying the dollar value of the end product times the number of days the commitment is/was overdue. The unit of measure "dollar-days" is neither monetary nor time based. Attempts to compare dollar-days to other monetary measures are invalid. TDDs can be compared only to other TDD levels.

Example: Suppose in the month of January a certain supplier was late delivering 2 orders. The first was 10 units of Part #1234 each having $45 of throughput; the order was delivered 2 days late. The second late order was for 5 units of Part #562 each having $70 of throughput; that order was 8 days late. The TDD for that supplier for January was 3700. ((10x45x2) + (5x70x8)).

See: inventory dollar days, throughput value days.

throughput per constraint unit (T/CU) – A ratio that quantifies the rate a specific product or service will, if sold, contribute to the throughput of the company. T/CU is calculated as the unit selling price minus the totally variable cost per unit of product or service, divided by the system constraint's capacity consumed, expressed in the appropriate unit of measure.

Usage: This ratio is most often used to estimate the impact a decision regarding a possible change in product mix will have on the company's throughput. T/CU is also used to quantify the true "cost" of unavailability of a system constraint.

T/CU should never be used alone. It is recommended to always calculate the impact that any change in product mix will have on throughput, investment, and/or operating expense before making a final decision.
Cautions: 1) T/CU should not be used to make decisions about product mix when there is no active capacity constraint.
2) T/CU should not be used to make decisions about product mix when a system has interactive constraints; in such cases, the decision should be based on the cumulative change in system throughput, investment, and operating expenses.
3) When there is insufficient protective capacity on non bottleneck resources, changing product mix based on the T/CU calculation can cause the constraint to shift, and thus invalidate the T/CU analysis.
Background: T/CU is derived from the economic principle known as the law of optimal allocation of scarce resources. This principle states that "*A scarce resource is best used to produce and sell those products with the highest contribution margin per unit of scarce resource".* The relevant unit of scarce resource or constraint capacity is usually processing time on the capacity constrained resource, but may also be a unit of storage space (e.g. if shelf space is the scarce resource as it usually is for a retailer), etc.
Example: If the relevant constraint unit is minutes, and it takes 2 minutes of constraint time to process a product that sells for $55 and has totally variable costs of $30, the T/CU = $12.50/min. ((55-30) ÷ 2).
See: capacity constrained resource, constraint, investment, operating expense, throughput, totally variable costs.

throughput value days (TVD) – A term used instead of throughput dollar days in countries where the dollar is not the base currency.
See: throughput dollar days.

throughput-world paradigm – The view that a system consists of a series of dependent variables that must work together to achieve the goal and whose ability to do so is limited by some system constraint. The unavoidable conclusion is that system/global improvement is the direct result of improvement at the constraint, and cost allocation is unnecessary and misleading. This paradigm is in conflict with the cost-world paradigm.
See: constraint, cost-world paradigm.

time buffer – Protection against uncertainty that takes the form of time.
See: assembly buffer, buffer, drum-buffer-rope, drum buffer, capacity buffer, feeding buffer, project buffer, shipping buffer.

to what to change? – The second question in the change sequence where the focus is on determining a set of injections that will eliminate the undesirable effects or convert the majority of them to desirable effects.
Usage: Typically, the evaporating cloud, future reality tree, and negative branch reservations are the set of thinking processes that are used to help determine the answers to this question. The answer to this question logically describes a desirable future state of the system.
Syn: what to change to?

See: change sequence, evaporating cloud, future reality tree, injection, negative branch reservation, thinking processes.

TOC – Abbreviation for theory of constraints.

tolerance time – The time a customer is willing to wait from when they place an order until they receive the product.

Usage: In many cases, the customer tolerance time is less than the replenishment time. In that situation it is often necessary to hold a stock buffer in order to not lose the sale.

See: replenishment time, stock buffer.

totally variable cost (TVC) – Those costs that vary 1-to-1 for every increase in the number of units produced.

Usage: In most manufacturing cases, the vast majority of TVC is raw materials. Commissions, outsourced heat treating, powder coating, and/or galvanizing are other common examples of TVCs. In almost all conventional manufacturing cases, labor is not a totally variable cost. TVC is subtracted from sales revenue as part of the throughput calculation.

See: throughput.

TP – Abbreviation for thinking processes.

transfer batch – The quantity or volume of output that is to be completed at a workstation before that output is transferred to the next workstation.

Usage: In many cases, setting the transfer batch size less than the process batch makes it possible to dramatically reduce production lead time.

See: process batch, production lead time.

transitional entity – An entity on the current reality tree (CRT), often a result of the conflict between entities D and D' of the core conflict cloud (CCC), that logically facilitates the linkage of the CCC at the CRT base upward toward the various undesirable effects.

Usage: A transitional entity is often a root cause or core driver for the undesirable effects characterized in the CRT.

Syn: entity.

See: core conflict cloud, core driver, current reality tree, entity, root cause, undesirable effects.

transition tree (TRT) – A thinking processes sufficiency-based logic tool that facilitates answering the third question in the change sequence, namely, how to cause the change? The TRT depicts a detailed, step-by-step set of actions that are needed to implement the desired change within an organization.

Usage: In creating a TRT, if..., then... sufficiency logic is used to map the sequence of detailed actions and their rationales that are required to move an organization from its current reality to the desired future reality as specified in the future reality tree. In particular, the TRT is formed by expanding the elements identified in the prerequisite tree into a more detailed set of needs, current states and future states or intermediate objectives expected, and actions required along with their respective rationales to address or overcome any anticipated obstacles.

See: change sequence, how to cause the change?, intermediate objective, obstacle, prerequisite tree, sufficiency-based logic, thinking processes.

transportation lead time – The time it takes to transport orders from the supply point to the to the next link in the supply chain. Transportation lead time is one of the components of replenishment time, along with order lead time and production lead time.
See: order lead time, production lead time, replenishment time, supply lead time.

tree diagram
Syn: logic tree.
See: current reality tree, future reality tree, logic tree, prerequisite tree, transition tree.

trimming injection – A state or condition that has been specifically designed to eliminate a negative branch that surfaces in a future reality tree.
Syn: injection, secondary injection.
See: future reality tree, injection, negative branch reservation.

TRT – Abbreviation for transition tree.

TVC – Abbreviation for totally variable costs.

UDE – Abbreviation for undesirable effect.

undesirable effect (UDE) – A negative aspect of the current reality defined in relation to the organizational or system's goal or its necessary conditions. UDEs are believed to be a visible symptom of a deeper, underlying root cause, core problem, or core conflict.
Usage: Some characteristics of a well-articulated UDE include: 1. a complete statement about a single consequence which does not contain the following words/phrases: 'and', 'because of', or 'as a result of'; 2. an effect that is within management's span of control; 3. something that exists in the reality of the organization precisely as stated; 4. something that is negative in its own right, without dependence on any other factor; 5. neither a presumed cause nor a presumed solution of the organization's core conflict or its major dilemma. Most, if not all, UDEs should appear as entities within the current reality tree.
See: core problem, current reality tree, entity, necessary condition, root cause.

unrefusable offer (URO) – A combined marketing and sales initiative that addresses the customer's core problem and creates a strong win-win for the supplier and customer. It is so called because, if constructed properly, the sales offer is too good to be refused by the customer. The URO is sometimes called by the slang term: mafia offer.
See: core problem.

unreported early finishes – The practice of not reporting that a task is finished early based on the belief to do so would cause negative side effects.
Illustration: A common negative side effect of reporting the early completion of a task is that the boss will demand that, in the future, similar tasks must be estimated at this shorter duration. Or, the worker may lose credibility if the boss concludes the original estimate of task

duration was wrong and therefore the worker must not know their job very well. For these reasons, workers frequently do not report an early finish.

URO – Abbreviation for unrefusable offer.

utilization – In TOC, activation of a resource that productively contributes to reaching the goal. Over activation of a resource does not productively utilize a resource.
See: activation, over activation.

V-plant – A production environment characterized by a small number of raw material items being converted through a series of diverging operations into a large number of end items. The logical network of material flow (not the physical flow) resembles the letter V in that it is narrow at the bottom (few raw materials), and diverges at the top (many end products).
Examples: Steel making, plastic extrusion, and oil processing are examples of a V-plant.

VATI analysis – The stratification of operations environments into four generic types referred to as: V, A, T, and I. Each environment has an inherent set of undesirable effects that, properly understood, make operations management easier. Each type is named for the letter that resembles a diagram of the logical flow (not the physical flow) of materials.
Usage: A single plant may be a combination of more than one type.
See: A-plant, I-plant, T-plant, V-plant.

wandering bottleneck – An undesirable effect in which the bottleneck moves relatively frequently from one resource to another.
Usage: Wandering bottlenecks are not constraints. Wandering bottlenecks can be caused by policies such as large lot sizes or using a transfer batch that is equal to process batch.
See: bottleneck, constraint.

want – An effect that one believes must exist in order to satisfy a need.
Usage: A want exists because of some set of assumptions that may or may not be either known or valid. Relative to an evaporating cloud, the existence of a prerequisite to satisfy a requirement is analogous to a want existing to satisfy a need. Wants are articulated as the D and D' entities within an evaporating cloud.
See: assumption, entity, evaporating cloud.

waste – Anything that does not contribute to reaching the goal.

wet tree – A thinking processes logic diagram that is not very tight from a logical perspective.
Usage: Frequently, a wet tree is characterized as having long arrows, i.e. gaps in logic, and/or errors in logic. The process of scrutiny is used to tighten the logic and produce what is then referred to as a dry tree, that is, one with tight logic.
See: dry tree, logic diagram, long arrow, scrutiny, thinking processes.

what to change? – The first question in the change sequence that focuses on determining the system's or organization's core conflict or problem.

Usage: Typically, the evaporating cloud and current reality tree are the two thinking processes that are used to help determine the answer to this query.
See: change sequence, core conflict, core problem, current reality tree, evaporating cloud, thinking processes.

what to change to?
See: to what to change?

X-Y syndrome – A problem that often occurs when TOC is not implemented holistically. It involves a power struggle between two functional areas of the company and can result in the stagnation or complete disappearance of TOC in spite of an incredibly successful implementation in one of the functional areas.
Example: Implementing TOC in department/function "X" (often in operations by implementing DBR) has two effects: 1. it changes the people in department/function "X" so their thinking aligns with the throughput-world paradigm, and, 2. as department/function "X" goes through the five focusing steps, improvement is so significant that the constraint shifts outside, let's say to department/function "Y" (often sales or distribution or product development). "X" then puts pressure on "Y" to improve by adopting TOC but "Y" resists because they still operate in the cost-world paradigm. Usually "Y" wins the internal battle because the rest of the organization is still looking at business using the cost-world paradigm. The result is that TOC does not spread throughout the organization and may even disappear completely if the TOC "champion" in department/function "X" gets frustrated and leaves the company.
Perspective: To avoid the X-Y syndrome, implement TOC holistically.
See: cost-world paradigm, holistic approach, throughput-world paradigm.

yellow zone (of the buffer) – The buffer management term for region II of the buffer. Generally, parts are supposed to arrive, or a task should be completed, in some portion of the yellow zone. Yellow, a sign of warning, is used to refer to this zone/region because any hole in the yellow zone should be checked to assess the potential of penetrating the red zone, and to plan a possible corrective action that may be taken when the hole penetrates the red zone.
Syn: region II.
See: buffer, buffer management, green zone, hole, red zone.