Introducing in-between decision points to TOC's five focusing steps

Pieter Pretorius
Email: pretoriusp@gibs.co.za

The Gordon Institute of Business Science, University of Pretoria, Johannesburg, South Africa

This paper builds on the original five focusing steps as defined by Goldratt (1992) as one of the constructs of the Theory of Constraints (TOC). The shortcomings identified are the sequential nature suggested by the five seemingly sequential steps, the lack of clarity relating to decisions that allows moving to next or previous steps, the assumed inapplicability of the five steps to dealing with market- and non-physical constraints (such as policy and behavioural constraints), and the lack of clarity surrounding an ideal constraint location. Deductive reasoning is applied to existing literature to arrive at conceptual solutions to the identified problems. The paper transforms the five focusing steps into a decision map which still includes all five steps, but allowing appropriate decision points to guide application of this process. It expands the applicability of the five focusing steps to both market and non-physical constraints, as well as presenting a logical argument why the best possible constraint location is 'the size of the market chosen to be served well'. Finally further clarity is provided why exploiting and subordinating to the constraint is necessary before constraint elevation should take place.

Keywords: theory of constraints (TOC), five focusing steps, decision points, continuous improvement

1. Introduction

The Theory of Constraints is a philosophy of focused continuous improvement based on systems thinking and system principles (Goldratt 1990a, 8-9, 58-63). The system principle, from which this philosophy lends its name, is the principle that all systems are constrained, and if the constraint is managed well, will provide a leverage point from which huge gains can be achieved (Senge 1990, 63-65). Goldratt (in Chapter 1 of Cox and Schleier, 2010) argues that TOC can be summarised with this one word: focus. One of the well known elements of the Theory of Constraints, is the five focusing steps, which allows for the focus element of the philosophy. The five focusing steps were put forward by Goldratt (1990a, 58-63) as a logical sequence of steps in order to capitalise on the constraint principle. It further allows that once a constraint is broken, one should continue seeking the next constraint, which even though the next constraint will not be as restricting as the previous constraint, will nevertheless still constrain the organisation.

Even though the five focusing steps make logical sense, and are always described as five sequential steps in the literature, in reality a number of decision points are to be found within the five focusing steps. Understanding these decision points will allow proper application of the five focusing steps since these decision points direct the focus to the essence of what the five focusing steps strive to achieve, namely a continuous process of doing what is necessary, and refraining from doing what is not necessary, in order to maximise system performance. This new verbalisation aims to improve the understanding and practical application of the five focusing steps. The fundamental structure of the five focusing steps however remains the same.

2. Literature review

2.1 *Previous discussions and research on the five focussing steps*

Mabin and Davies (2003), Pass and Ronen (2003), Umble, Umble and Murakami (2006), Coman and Ronen (2007), Geri and Ahituv (2008), Gupta and Snyder (2009), Kasemset and Kachitvichyanukul (2010) and Spector (2011) in their research largely discuss the five focussing steps as part of the underlying literature reviews as they were originally presented by Goldratt (1990a, 58-63). Authors that have discussed and analysed the five focussing steps in more detail are amongst others Coman and Ronen (1995), Ronen and Starr (1990) and Floyd and Ronen (1989), and all of them are alluding to seven steps rather than five steps only. Balakrishnan, Cheng and

Trietsch (2008) are highly critical of the Theory of Constraints, but their criticisms are largely based on the fact that TOC is not anything new, and that implementation of Theory of Constraints might lead to over emphasis of some issues while ignoring others. Their criticism of the five focusing steps does not seem to invalidate anything currently known about the five focusing steps. Youngman (2009) suggests some in-between decision points. His contribution will be included in the discussion section of this paper. Mabin and Balderstone (2000), Mabin and Balderstone (2003) provides comprehensive coverage of the TOC and the five focusing steps literature, theory, application and results.

2.2 *Pre-requisite steps to the five focusing steps*

Before the five focusing steps can be analysed, the two prerequisite steps to the five focusing steps need to be defined (Goldratt 1990a, 10, Cox and Spencer 1998, 55, Ronen and Spector 1992 and Scheinkopf, 1999, 23-24):

- Since an organisation is a system, and since organisations are goal seeking, one must define the goal of the organisation first. Without a goal, constraints cannot be identified since constraints are those things that prevent an organisation from achieving a higher level of performance.
- In order to quantify existing level of performance, as well as the effect of any intervention (through the five focusing steps) might have on organisational performance; appropriate measurements must be in place.

2.3 *The five focusing steps*

For most that have been exposed to the Theory of Constraints, their first encounter with the five focusing steps is the description by Goldratt and Cox (1992, 297) in the novel, The Goal, first published in 1984 (Cox and Spencer 1998, 13)**,** which has subsequently seen three revised editions.

In its most basic form the plain common sense steps are (Goldratt and Cox 1992):

STEP 1: Identify the system's bottlenecks.
STEP 2: Decide how to exploit the bottlenecks.
STEP 3: Subordinate everything else to the above decision.
STEP 4: Elevate the system's bottlenecks.
STEP 5: If, in a previous step, a bottleneck has been broken go back to step 1.

For the explanation of the five focusing steps (Goldratt 1990a, 59-63) that follows, the more common phrasing of the five focusing steps will be used, where the word bottleneck is replaced by the word constraint.

Step 1: Identify the system constraint

Since the constraint of the system determines the system performance, it follows logically that maximum system performance can only be achieved by knowing where the organisational constraint is. It is therefore essential that the constraint be identified as a first step.

Step 2: Exploit the system constraint

The natural reaction in traditional management is to immediately get rid of constraints by throwing money at the constraint. This is however not what is being done within constraint management since once a constraint is broken there will be a new constraint. As a second step, the exploitation of a constraint attempts to make optimal use of the limitation imposed; do not waste any of the constraints scarce capacity. In other words, it means to make do with what is currently available.

This step defines the management rules for the constraint only. By implication this step can only be used when dealing with physical constraints, a problem which will be overcome with the proposed decision points within the five focusing steps.

Step 3: Subordinate everything else to the constraint

This step deals with all the non-constraints that require them to be working in such a way to support the constraint but not doing anything more than that. For non-constraints, who per definition must have more capacity than the constraint, doing anything more will only produce work in progress which cannot be handled by the constraint, therefore leading to unnecessary work-in-progress without increasing sales. Step 3 only deals with the management rule(s) for the non-constraints, sometimes referred to as the road runner ethic or behaviour. This means non-constraints should be acting like the road runner from the cartoons; either you run flat out or you do nothing. The level of utilisation of non-constraints is determined by the capacity and utilisation of the constraint, not by the potential of the non-constraints.

Step 4: Elevate the system's constraint

Once further system improvement is not possible with exploiting and subordination, the next step would be to elevate the constraint's capacity. This implies adding physical capacity, which unlike exploiting normally asks for investment or spending, and requires a time lapse before this intervention can be completed. Once capacity is added to the existing constraint, the constraint might be broken, which implies a new constraint, or the constraint can remain in the same place but now having elevated capacity resulting in a higher level of system performance.

Step 5: If, in any of the previous steps the constraint has been broken, go back to step 1 but do not allow inertia to become the system constraint

This is the only step that currently has an explicit decision within it. This decision checks for the breaking of the constraint, which if true requires the returning to step 1, since there will be a new constraint. This allows one to embark on a process of continuous improvement. Even though not stated, if the constraint has not been broken by the elevation, then it is required to continue with steps two and three, exploiting and subordination. The inertia part of this rule is interpreted in different ways. Some consider inertia the act of complacency that prevents the returning to step 1 (Cox and Spencer 1998, 61), whilst Goldratt (1990a, 63, 96-98 and 1990b, 6) and McMullen (1998, 44) imply it as the inaction to remove the old rules and policies when exploiting and subordination of the old constraint. Cox et al (2012) in the TOCICO Dictionary defines inertia as "Many people required to perform tasks for which the reason no longer exists". It seems therefore obvious that inertia refers to the literal physical meaning of "…not wanting to change direction or speed", i.e. continue doing things as if the constraint has not been broken. Step 5 therefore requires seeing the system as a new system where all the old rules and policies (ways of doing things) need to be questioned. The new constraint identified in step 1 will require new rules for the new constraint (which has been a non-constraint before) and new rules for a different set of non-constraints (which will now include the old constraint).

2.4 *Classification of constraints*

Goldratt (1990a, 62-63), Cox and Spencer (1998, 64), McMullen (1998, 20-21) and Scheinkopf (1999, 16-21), provide the classification for constraints which will be used for this research i.e. physical and non-physical constraints. Since a constraint is anything that limits the system form a higher level of performance, it can be that one has limited production capacity or limited market demand (both physical constraints), or it can be that one is limited by bad management policies (e.g. large lot sizing policy) or bad human behaviour (e.g. hidden agendas or apathy). The latter two are both non-physical constraints. Cohen (2009, 40) talks about throughput and behavioural constraints,

attaching the same meaning to it, namely physical and non-physical. According to Cohen (2009, 45-47), as far as physical constraints are concerned, one can have an internal constraint (lack of production capacity or a lead-time constraint), or an external constraint (lack of market buying capacity).

2.5 *The five focusing steps and linear programming*

Linear programming is considered as the scientific foundation for the five focussing steps (Ronen and Starr, 1990), but by no means is it suggested that linear programming and the five focus steps are equivalent. Linear programming as the scientific foundation for the five focusing steps is only applicable when one deals with physical constraints. Should one deal with a physical internal constraint, not only will linear programming allow for the identification of the constrained resource, but will also provide the solution to the optimal mix problem, assuming the constraint set will stay as given. It is however argued by Mabin and Gibson (1998) that using TOC's five focusing steps encourages far more effective exploitation of the constraint, extending to changing the constraints, and yielding far better results than linear programming on its own. Should one however deal with a market constraint, linear programming will highlight the market as the constraint but will not provide for any further decisions. The objective of this paper however, is to ensure a broader application of the five focussing steps to also include non-physical constraints, which is not possible to address when using linear programming.

3 Problem statement

The sequential nature of how the five focusing steps is presented, does not fully explain the complexity of going through these steps. Even though never explicitly stated nor denied, the five focus steps never exclude any specific type of constraint even though it seems to favour physical internal constraints, therefore seemingly excluding market constraints and also behavioural constraints.

Goldratt (1990a, 82) himself states that

> …the five focusing steps seem to give the generic decision process that enables us to climb the information ladder: from basic data to the next level, that of identifying the systems (sic) constraints, then to the higher level of deducing tactical answers, which finally leads to the financial bottom line information.

Goldratt (op cit) further states:

> What we should bear in mind is that the five steps by themselves are not sufficient. To actually climb the information ladder (getting answers to our questions posed by the steps) we have to develop detailed procedures that stem from them (the five steps)

It is thus acknowledged that a higher level of understanding is required to execute each of these steps.

McMullen (1998, 44) offers a general purpose alternative to the five focusing steps to cater for both physical (internal and external) constraints, as well as behavioural constraints by offering generic approaches using TOC logic trees within each of these steps. This requires an understanding of TOC's logic trees which might not be familiar to all. However, an additional problem is identified, one this research attempts to solve, namely a lack of decision points between the steps, rather than within the five steps, as proposed by McMullen (1998). This newly proposed view

including decision points between steps will provide a more holistic strategic and generic process rather than just a tactical within-the-step process.

Newbold (1998, 150) offers a different view of the five focusing steps, specifically adapted for the project environment, but has presented it graphically as a cause-effect diagram rather than a process diagram with decision points. Schragenheim (1999, 5-7) offers another verbalisation without making a graphic representation. Youngman (2009) combines these two verbalisations into a single representation and makes a strong argument of the strategic and tactical dimensions of the five focusing steps. The shortcoming of Youngman's representation is the handling of a single decision point *within* step 4 only, rather than on a logical higher level, namely *in-between* the steps decision points, which will determine the nature of step 4. A further shortcoming of this representation is not considering the application of the five focusing steps to non-physical constraints. He also mixes breaking the constraint by exploiting well (step 2) with elimination (step 4), which causes confusing interpretations of steps 2 and 4. This research will illustrate and detail the required in-between decision points as well as consider the existence of non-physical constraints.

An additional problem identified to be addressed relates to the choice of the constraint, since

> …the core idea in TOC is that every real system such as a profit-making enterprise must have at least one constraint. If it were not true, then the system would produce an infinite amount of whatever it strives for. In the case of a profit-making enterprise, it would be infinite profits. Because a constraint is a factor that limits the system from getting more of whatever it strives for, then a business manager who wants more profits must manage the constraints. There really is no choice in the matter. Either you manage constraints or they manage you. The constraints will determine the output of the system whether they are acknowledged and managed or not" (Noreen, Smith, and Mackey, 1995, xix)

Since the five focusing steps allow for the constraint to be broken, and one needs to consciously choose and manage the constraint, it leads to the question as to the ideal location of the constraint.

The final problem to be addressed does not constitute a real problem, but rather the question relating to the necessity of exploiting the physical constraint and subordinating the non-constraints before elevation of the constraint is to take place. Clarity surrounding this question will enhance proper understanding and application of steps 2 and 3.

4 Discussion

4.1 *A new verbalisation of TOC's five focusing steps to include in-between decision points*

The sequential five focus steps forms the basis of the new verbalisation, subject to the two prerequisite steps of defining the organisational goal and the appropriate measurements, both which are strategic decisions. The new verbalisation for the five focus steps, followed by a graphical representation (Figure 1) is as follows:

Step 1: Identify the system's constraint

Identifying the constraint has exactly the same meaning as in previous verbalisations. Find the one factor that limits the system's performance. What makes this verbalisation different however is that it is explicitly stated that the nature of the constraint is not important. The constraint can be a physical internal or external (market) constraint), or it can be a damaging behavioural or a damaging policy constraint. The specific tactics used to identify the constraint is not prescribed, but a holistic view of the organisation should be taken to ensure system rather than local optimisation (Sterman 2000, 22). When this step is taken for the first time, it is a tactical step. However, if over time an organisation has gone through the five focusing steps a number of times, this step really changes to a strategic decision to choose the ideal constraint location, rather than to identify the

constraint. Choosing the ideal constraint location is a strategic decision and will be dealt with in detail in paragraph 4.2.

Decision point a – Is the constraint physical?

Given the identified constraint from step 1, evaluate the identified constraint to determine whether it is a physical or behavioural/policy constraint. If the identified constraint is physical, proceed to step 2. Should the constraint be a behavioural or a policy constraint, proceed to the first alternative step 4 (two new alternative steps 4 are proposed). In this first new alternative step 4, the meaning of elevate will change to remove and replace, and is explained in detail later.

Step 2: Exploit the constraint

This step only deals with physical constraints, either an internal constraint or a market constraint. This is due to the meaning of exploit being to optimally making use of the limited capacity a resource has (Cox et al 2012, 53). Thus do not waste any time on your scarce resource (internal constraint) or do not lose any sale when the market is constrained (lack of capacity to buy). Exploiting a market constraint might mean buffering the market with stock if possible to ensure 100% delivery and/or to segment the market i.e. enter new markets that are not as lucrative but still profitable.

For a non-physical constraint (i.e. policy or behavioural constraint) this step is not applicable. After deciding how to exploit the physical constraint, proceed to step 3.

Step 3: Subordinate everything else to the constraint

Similar to step 2, step 3 is only applicable to physical constraints since a behavioural or policy constraint (non-physical constraint) is inherently flawed and damaging, therefore subordination is not possible. The meaning of subordination in this verbalisation is exactly the same as the original verbalisation as proposed by Goldratt (1990a, 60-61). Non-constraints subordinate to the constraint by only doing what the constraint can handle, no more; i.e. stop working when the constraint need is sufficiently satisfied. Per definition non-constraints have more capacity than the demand placed on it. The capacity a non-constraint has available more than the demand placed on it, consists of protective capacity (Cox et al, 2012, 102-103), to allow for protection against variances in the system, and excess capacity, which is any capacity beyond the protective capacity needed for handling uncertainties (Cox et al, 2012, 52). Step three also requires the abolishment of local efficiencies as indicated by Goldratt (2009, 334). It is beyond the scope of this research to justify the need for protective capacity. Should information be sought on this topic, consult Goldratt and Cox (1992, 93-147).

For internal physical constraints the method for subordination is the Drum-Buffer-Rope (DBR) method, and for physical market constraints simplified Drum-Buffer-Rope (S-DBR) is the appropriate subordination method. It is beyond the scope of this research to include a detailed discussion on these subordination methods. For further information Cox and Schleier (2010) and Schragenheim, Dettmer, and Patterson (2009) can be consulted.

Decision point b – Is subordination to the constraint possible?

The next decision point deals with making sure the right physical constraint has been chosen. As will be shown in paragraph 4.3, it can happen that the wrong constraint has been chosen. Having chosen the wrong constraint will not render the expected improvements, which necessitates this decision point. This decision point will almost automatically be arrived at if the wrong constraint has been chosen, since the real constraint will now be subordinated to a non-constraint, something which is physically impossible, and which will become visible almost immediately. If subordination

is not possible, i.e. the wrong entity has been chosen as the constraint, return to step 1. If subordination is possible, i.e. the correct constraint has been chosen, proceed to decision point *c1*.

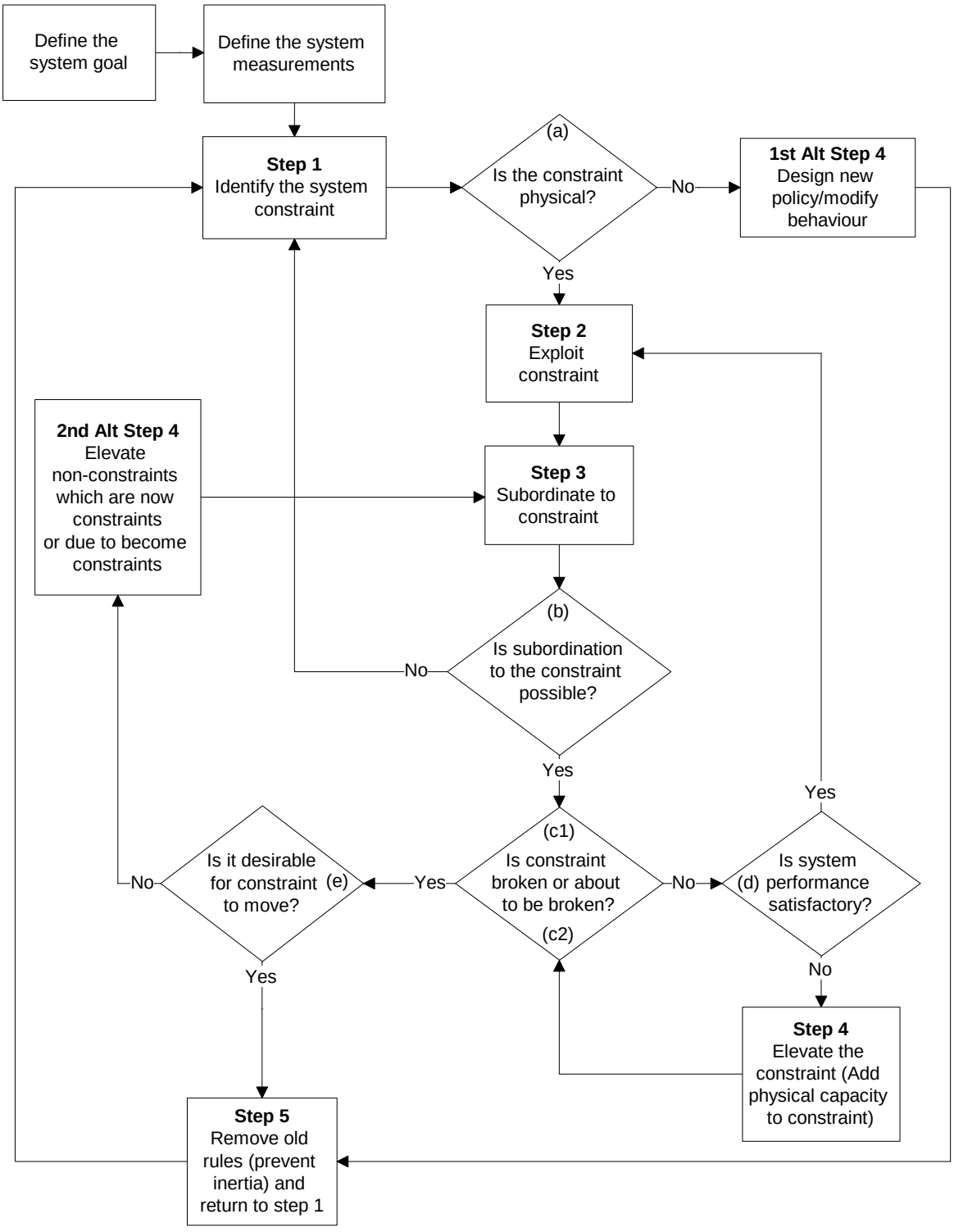

Figure 1. The five focusing steps with all in-between decision points included

Decision point c1 – Is the constraint broken or about to be broken?

After steps 2 and 3 have been completed (including the check for having chosen the right constraint – decision point *b*), the constraint must be evaluated to determine whether it is broken or about to be broken. This evaluation must also include determining whether non-constraints are close to becoming constraints, which is not desirable, since having balanced capacity will destroy flow through the system. One has to ask this question, since exploiting and elevation can already cause the constraint to be broken, and therefore for non-constraints to become a new constraint. If the constraint has been broken, or it is about to be broken, proceed to decision point *e*. If the constraint is not broken or about to be broken, meaning that neither the constraint nor any non-constraints are due to become constraints in the near future (this evaluation necessarily has a predictive element to it), then go to decision point *d*.

Decision point c2

Even though the evaluation made at this point is exactly the same as the evaluation made for decision point c1, the arrival at this decision point is due to elevation of the constraint (step 4) and not due to the effects of exploiting and subordination (steps 2 and 3). The exit routes from decision point c2 are the same as for decision point c1.

Decision point d – Is the system performance satisfactory?

If the system performance is satisfactory, then return to exploiting the constraint (step 2) and subordination of non-constraints to the constraint (step 3). This completes the day-to-day management activity or the day-to-day tactical loop, as suggested by Youngman (2009). Mabin and Gibson (1998) provide a case in point that once going back to steps 2 and 3, the decision rules in steps 2 and 3 might change even though the constraint has not been broken. This is also true when going back to exploiting the constraint (step 2) after elevation has taken place (step 4) without breaking the constraint. Thus for any manager of operations, their day-to-day task is to exploit and subordinate, and should the constraint not be under their control, their primary daily management task is only to subordinate non-constraints to the constraint. If the system performance is not satisfactory, then go to step four, which is to elevate the constraint i.e. add physical capacity. Going this route is a strategic route, since elevation normally requires capital investment or major spending.

Decision point e – Is it desirable for the constraint to move?

This strategic decision deals with desirability of the constraint to move or to remain in the same place. Should the constraint be where it is not desired (e.g. at resource normally available in abundance), then it should be allowed to move. Paragraph 4.2 deals with the most desirable location of the constraint. If the constraint is allowed to move, proceed to step 5. If the constraint is to remain in the same place, then proceed to the second alternative step 4.

Step 4: Elevate the constraint

The verbalisation for this step remains exactly the same as it was originally intended. Internal capacity is elevated by adding physical resources to the constraint, be it people, equipment or any other physical resource which is limited. Elevating the market constraint might require a new marketing and/or sales effort, designing and producing new products or services, accessing new market segments or coming up with an unrefusable market offer. Similar to steps 2 and 3, step 4 is only applicable to physical constraints. Once finished with this step, proceed to decision point *c2*.

First alternative step 4: Design new policy/modify behaviour

This step is introduced to cater for the non-physical constraints. Since non-physical constraints are not scarce resources but inherently flawed and damaging policies and/or behaviour, it cannot be exploited nor subordinated to. Therefore once the constraint has been identified as a policy or behavioural constraint, then the first alternative step 4 comes into play. This step requires the design of a new policy and/or the modification of behaviour and is therefore a decision of strategic nature. Since the policy changes required by systems thinking are often quite radical and counter-intuitive (Sterman 2000, 22), this step is probably one of the most difficult (Cox and Spencer 1998, 59, 66), since it deals with humans which see changes as threatening. Similar to the other steps, this research is not aimed the tactical execution level of the five steps, but this step cannot be described without raising the caution about possible resistance to change. Even though beyond the scope of this research, methods than can be used for this step (and identifying non-physical constraints) include the TOC Thinking Processes (Scheinkopf 1999, Cox et al 2010) and Systems Thinking (Sterman 2000). Once completed, proceed to step 5.

Second alternative step 4: Elevate non-constraints

This second alternative step 4 is to cater for physical constraints being broken or about to be broken, but where it is undesirable for the constraint to move. Since the constraint is broken or about be broken, coming from decision point *c1* or *c2*, it is logical that the constraint will move to a different place if nothing else is done. Since decision point *d* provided the answer that it is undesirable for the constraint to move (for example when it already is in the place where it has been chosen to be), then it naturally follows that the only way to prevent the existing constraint to move, is to elevate (add capacity to) resources that have now become the constraint or are about to become the constraint (again this evaluation necessarily has a predictive element to it, thus being proactive to prevent non-constraints to become the constraint). Once elevation is complete, go back to step 3 and continue to subordinate to the same (but now elevated) constraint. The practical implication is that the rules for exploiting and subordination have stayed the same which makes for stability within the organisation even though elevation has taken place. Similar to all other variations of step 4 this is a strategic step. Once this step has been executed well, the overall system performance would have increased, without having moved the constraint.

Step 5: Remove the old rules and return to step 1

This means that all the old rules pertaining to the previous constraint (physical and non-physical) and non-constraints need to be removed (prevent inertia) and must be returned to step 1, to ensure the process of continuous improvement. Again, Mabin and Gibson (1998) demonstrate the need for re-evaluating policies and rules once a major threshold has been crossed.

4.2 *The ideal physical constraint location*

All organisations have at least one physical constraint which must be consciously managed (Noreen, Smith, and Mackey 1995, xix). The question that inevitably is raised is what the ideal physical constraint location would be. An argument might be made out for selecting a true internal constraint (also known as a bottleneck) (Cohen 2009, 98), which implies much better control, but at the same time one would suffer from missed sales and unreliable supply to customers. A market constraint on the other hand implies no missed sales, excellent reliability to customers, but an unhealthy exposure to market fluctuations and money spent on unutilised (and often expensive) capacity.

The answer to the question of the ideal constraint location is to ‘choose the size of the market to be served well’ (Cohen 2009, 47). The first implication is that the size of the organisational capacity is less (often much less) than the overall market demand. If that is not true, then a true

market constraint will exist. If the size of the capacity is less than the overall market demand, then a true internal constraint (bottleneck) will exist. However, a true internal constraint will only exist if more orders are accepted than the available capacity. The key is therefore to choose the number of orders to accept, without overloading the capacity of the organisation. It allows for a certain amount of capacity necessary for dealing with statistical variation of the internal capacity, hence the phrase, protective capacity (Cox and Spencer 1998,105-106). Protective capacity is thus that amount of capacity necessary required on non-constraints to safely deal with any internal disruptions while at the same time ensuring reliable supply to customers (Cox et al 2012, 102-103). Often excess capacity exists on non-constraints beyond the needed protective capacity (Cox et al 2012, 52). The protective capacity equals the difference between the actual capacity and the market size chosen, with a limited amount of excess capacity only on some resources. The limit to the excess capacity on some resources is the result of choosing the size of the market to be served well, followed by choosing enough (but not too much) protective capacity required for that chosen market size. The resources where excess capacity will still be found will most probably be those non-constraints where a slow enough resource cannot be found.

Numerous benefits can be had when the constraint is in its ideal location. The benefits of choosing the size of the market to be served well as the constraint are:

- Customers experience a high service level (quality, reliability of supply, short lead times) leading to more desirability of the product or service, which in turn leads to higher prices and higher profits.
- The organisation is not exposed to statistical variation of market demand, and does not rely on forecasts for the short term, even though a premium is paid for having a certain amount of protective and therefore unutilised capacity. The statistical variation of market demand is now left to other players that cannot secure sufficient orders to keep most of their capacity utilised. It is for this reason that being a monopoly might not be such a good idea, since you will always be exposed to market demand fluctuations, and not having the opportunity to increase or decrease your presence in a market segment when market demand changes.
- Growth can take place whenever the organisation chooses, provided the total market demand is not exceeded. This takes place by choosing a larger size of the market to serve well, but before the chosen market size is increased, the non-constraints (internal capacity) that will become the constraints are elevated before more orders are accepted, effectively keeping the constraint in the (now larger) size of the market chosen. Alternatively, when overall market demand threatens to drop below actual capacity, one option (as opposed to getting rid of capacity) is to enter new market segments which may not be as profitable, but profitable nonetheless to maintain capacity levels.
- The constraint effectively never moves, since it stays in the size of the market chosen, meaning that the internal business rules (subordination – step 3) remains the same leading to internal stability.

It has thus been demonstrated that it is possible to ‘manage’ the constraint as suggested by Noreen, Smith, and Mackey (1995, xix). A practical application of this principle is already practiced for example by many business schools (knowingly or unknowingly) where the number of seats is limited and filled by the best candidates. Once the seats are filled, the unsuccessful applicants can apply to the next school, until they get accepted or not get accepted anywhere at all. The business school whose seats have filled up first, does not have to work on any forecasts of demand, they know what the demand is and plan sufficient capacity (lecture rooms, faculty, meals, text books, notes etc) accordingly. Should they choose to grow in a next academic year, they can do so provided they still have an oversubscription for the new market size chosen, and have expanded capacity sufficiently beforehand (size and timing) to be able to deal with the increased size of the market chosen. Choosing your constraint as the size of the market you want to serve well, having sufficient capacity, and choosing when and by how much to grow, are illustrated in Figure 2.

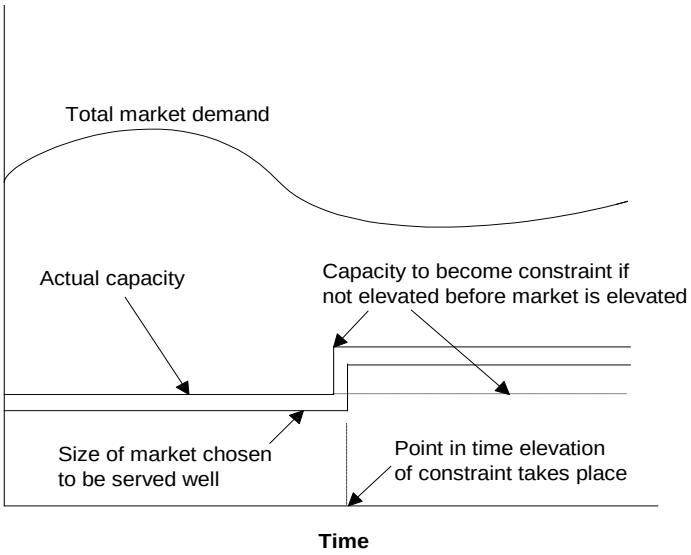

Figure 2: Ideal constraint location graphically explained

4.3 Why exploiting and subordination is necessary before elevation of physical constraints

The last question that needs to be answered relates to the need to first exploit (step 2) and subordinate (step 3) before elevation (step 4) can take place for physical constraints. Both steps 2 and 4 deal directly with the constraint, which is in line with the focus requirement of TOC. The essential difference between the two steps however relates to getting the maximum from the available capacity that already exists and is getting paid for (steps 2 and 3), and add more of what you currently do not have and will have to pay for in future (step 4) (Cox and Spencer 1998, 65-66). Understanding this difference between exploit/subordinate and elevate lead to the following reasons why steps 2 and 3 are necessary before step 4:

- Exploit/subordinate does not cost anything more than what already is paid for, elevation requires additional funding (Marton and Paulova 2010, 74).
- Exploit/subordinate does lead to immediate performance benefits, because inherent capability is unlocked, whereas elevation requires a time lapse before real performance benefits are realised, due to the delay of creating more capacity and additional funding requiring a payback of additional costs and/or investments. Creating more capacity (elevation) takes more time (than exploiting) due to the physical nature of elevation e.g. adding more classrooms and office facilities to a business school, or appointing and training more staff, something which cannot be done instantaneously.
- Sometimes when exploiting/subordination take place, the constraint can be broken without requiring any elevation, thus saving additional and often unnecessary expenses.
- In complex organisations it is possible to unknowingly select the wrong constraint. If elevation takes place when having the wrong constraint, unnecessary expenses will be directed to what is really a non-constraint. With exploiting/subordination of the wrong constraint the real constraint will show itself in a very short time period, since a constraint cannot be subordinated to a non-constraint.
- Once exploit/subordinate has taken place, the real capacity of the organisation is known, since the constraint capacity determines the capacity of the system, serving as a baseline from which elevation can take place. This allows the size of the elevation to be decided on.
- Exploit/subordinate already improves organisational performance i.e. profits, which can be used for funding subsequent elevation of the constraint.

5 Conclusion

This paper does not attempt to invalidate or fundamentally change the five focusing steps as first proposed by Goldratt. The purpose was to enhance the understanding of the five focusing steps by adding detailed decision points that will allow a more practical application of this already powerful construct. The proposed five focusing steps flow diagram allows a more holistic approach and solves some problems or objections to the five focusing steps, while at the same time provides clarification to enhance understanding. The following objectives were achieved with the proposed five focusing steps flow diagram:

- Demonstrate the applicability of the five focusing steps to all types of constraints, regardless of it being physical constraints or not.
- Demonstrate the dynamic, decision making nature embedded in the five focusing steps by adding decision points relating to the type of constraint, whether the correct constraint has been identified, whether system performance should be further improved, and whether the constraint should be allowed to move or not.
- Demonstrate the need for reconsidering how to exploit and subordinate continuously even though the constraint might not have been broken.
- Demonstrate the reasoning and strategy when the constraint should remain in the same place.
- Argue the need to choose the constraint as the size of the market to be served well.
- Argue the necessity for exploiting the constraint and subordination of non-constraints before elevation of the constraint should take place.

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