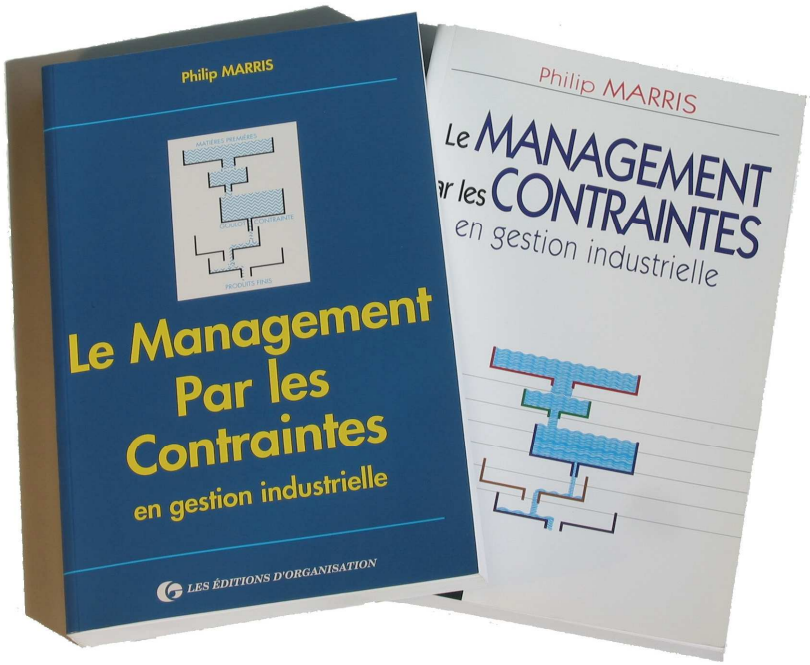
Philip Marris

Constraints Management

The Theory Of Constraints (TOC) applied to industrial operations



Executive Summary of the 1994 book with a very rough update in 2012

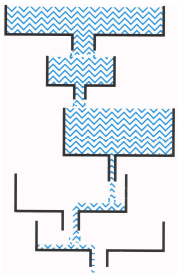
Marris Consulting

Version 1.42 UK 20121116

© Marris Consulting. Translation + a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

Constraints Management

The Theory Of Constraints (TOC) applied to industrial operations



WARNING N°1

This text was initially written in 1994. It is the translation from French into English of the introduction to the book *Le Management Par les Contraintes en gestion industrielle* (Editions d'Organisation, Paris, France, 1994, 1996, 2000, ISBN 2-7081-1666-5) by the author Philip Marris.

A few comments or modifications have been added to the text in square brackets [...].

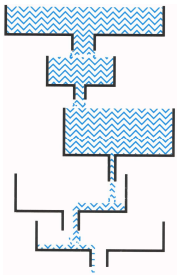
The world has changed in the past 18 years – SAP, China & internet to name just three new elements –, so please forgive some of the obsolete comments. If I submit to you this old text it is because I believe that, unfortunately, a lot of what I wrote is still pertinent.

This text is only a part of the comments that I would like to make. I wish I had the time to write the rest and present it all in a well structured form. Until that day this is all I have. I hope it helps you. I have used these ideas in over 100 companies now. They enable very fast improvements in performance.

© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

Constraints Management

The Theory Of Constraints (TOC) applied to industrial operations



WARNING N°2

This text does not represent the author's current views on the importance of integrating the 3 main approaches used in the world today: TOC / Theory Of Constraints, Lean and Six Sigma. This combination is often referred to as ***TLS***. Industrial improvement efforts over the past 20 years have been handicapped by quarrels concerning the relative merits of the different approaches and of the supposed incompatibilities or fundamental differences among them. TLS considers, on the contrary, that we should seek to combine them thereby creating a system that contains the best aspects of each movement. Each school of thought – Lean, Six Sigma & TOC – has proven its effectiveness, otherwise they simply wouldn't exist. In combination they are formidable.

To summarize the 3 components:

Theory Of Constraints (TOC) or Constraints Management

- Focus on improving the system constraints that determine overall performance…
- …and in this way significantly boost the return on investment and success of Lean & Six Sigma programs
- Increase profits by increasing sales rather than by cutting costs and hence avoid headcount reductions
- Developed by Eliyahu Goldratt in the 1980s

Lean Manufacturing / Toyota Way

- By far the most widespread approach in industry throughout the world
- A focus on eliminating all forms of waste
- A multi-dimensional approach: management, Just-In-Time, 5S, Lean Engineering, …
- Developed by the Toyota Motor Company in the 1950s, called "Lean" since 1990

Six Sigma

- Reduce process variability to 3.4 defects per million occurrences
- Mostly implemented using certified experts Green Belts, Black Belts, …
- Includes a powerful tool to be used on important and complex problems (Design Of Experiments)
- Promoted by Motorola & General Electric in the 1980s.

TLS: TOC + Lean + Six Sigma

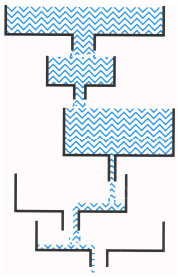
- Emerged in 2006

Ignore the quarrel among experts. Think for yourself. Do your own integration of the different ideas that appeal to you. Call it your X Production System or your X way. That is what Toyota did. That is what we should all do.

© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

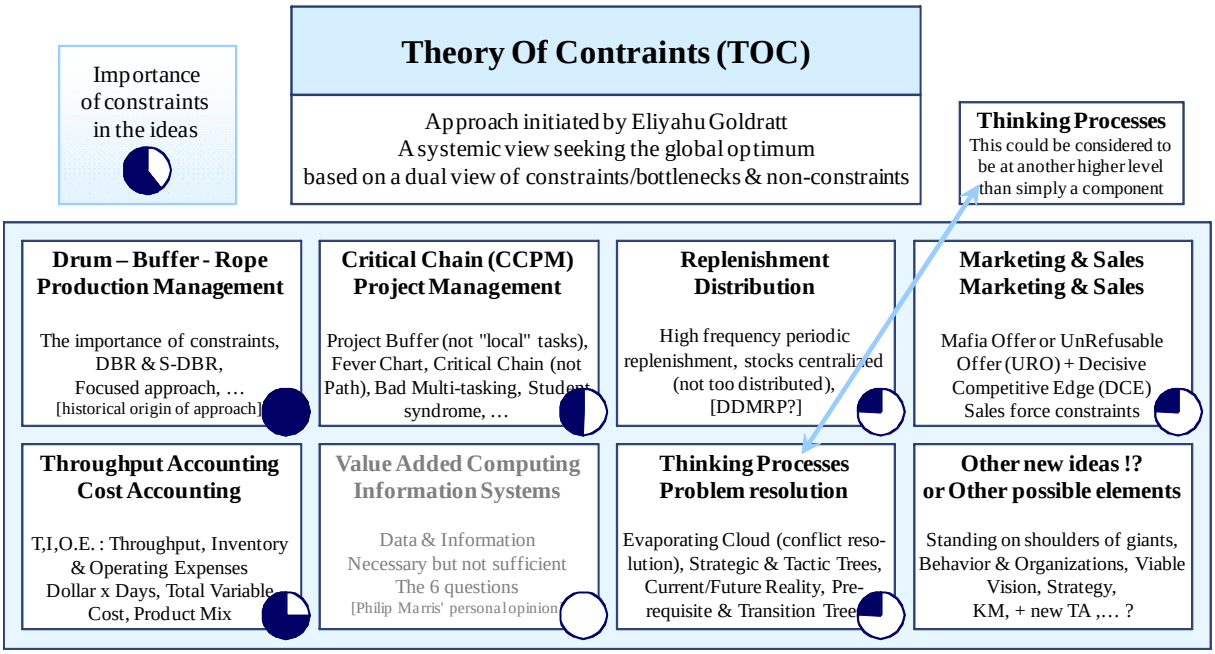
Constraints Management

The Theory Of Constraints (TOC) applied to industrial operations



WARNING N°3

Since the original text of my book was written in 1994 the Theory Of Constraints has developed to cover many aspects of business. I dare summarize the state of TOC today in the diagram below. **My book only deals with 1/8th of TOC**; the top left hand box (Drum – Buffer – Rope / Production Management).



It would take at least one book to explain this summary and then one book per box. The TOC community will no doubt criticise this presentation. If I dare present TOC in this way it is not to be provocative but simply because, to the best of my knowledge, there is no official TOC summary as I write this in 2012. Furthermore TOC is still developing; I have to change the above presentation nearly once a year. This is just my best attempt at an objective summary of TOC in November 2012. I would be happy to replace this by a consensual collective and/or official summary of TOC rather than my own point of view.

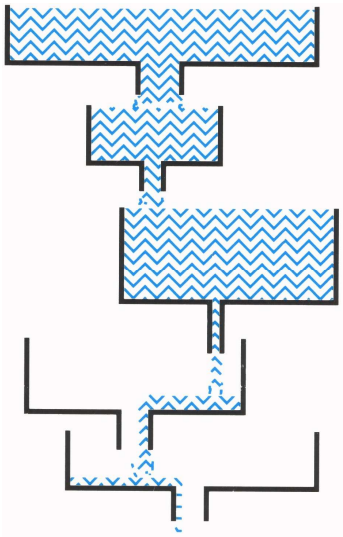
© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

Constraints Management

The Theory Of Constraints (TOC) applied to industrial operations

The origins of Constraints Management can be traced back to a school of thought called OPT that emerged around 1970. These ideas are often referred to as the “Theory of Constraints"

It is based on the distinction between two types of resources: bottlenecks or “constraints” and non-bottlenecks. If one pictures a manufacturing process as a series of linked tanks through which the products flow, a “bottleneck” is a resource that limits the flow; increasing its diameter would increase the flow of the whole company which is not the case for the other “non-bottleneck” resources.



Such a production line is said to be *unbalanced*: the resources doing different tasks (in general these are machines and/or people) do not all have the same capacity. What makes Constraints Management unique is that it considers that in today’s world unbalanced plants have become not only *unavoidable*—which means that the constraints must be identified and the company managed according to its current mix of capacities—but also *desirable.* One must therefore identify the ideal unbalanced distribution of capacity and invest in such a way as to get as close to it as possible.

It follows that rather than handle all resources in the same way one must adopt a *dual view*: distinguish what should be the focal point of the organisation (the constraints) from the rest (the non-constraints). Since by definition non-bottlenecks have excess capacity it is clearly counterproductive to seek their full utilisation; all local productivity targets should therefore be eliminated and replaced by measurements that view the business as a whole. This in itself will greatly improve the performance of the company by bringing its management rules into line with the realities of today’s unbalanced plants.

A transfer of investments from stocks to capacities

In today’s highly competitive environment companies must constantly seek to reduce the time they take to react to fluctuations in demand and new technological opportunities. The Japanese have demonstrated that the best way to do this is to reduce stocks, not only because stocks are synonymous with inertia, but also because they hinder the process of on-going improvement by hiding the root causes of problems on the factory floor or elsewhere. In a world where one can no longer be sure of selling what one has produced, stocks are a risky investment which consumes both time and money:

© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

they are a liability, not an asset. Faced with a strongly seasonal demand, it may be better to have a capacity close to the forecasted peak demand rather than run the risk of building up very large stocks in anticipation of future sales.

Investment is therefore being shifted from stocks to capacities. But what reasoning guides this movement? How, at the planning stage, does one choose between a factory that costs £10m and runs with 10 days of stocks and another that costs £9m and 100 days of stocks? The slogan of "zero stocks"—which the Japanese have adopted—would point to the first solution whereas traditional financial analysis would favour the second.

Whatever the answer to this question, will this plant be balanced? Will all the resources have the same capacity? Officially everyone would say they should, after all, excess capacity is a waste of money. Then how come there are no longer any balanced plants be it in Japan or in the West?

Factories are condemned to be unbalanced

Traditional management techniques aim to balance a plant. But this involves juggling with the dates of work to be done—delaying or bringing forward tasks to spread work evenly—which requires not only long production lead times and hence excessive quantities of stocks but also the possibility of rapidly varying the production capacity of resources to meet market demand. Given today's prohibitive hidden costs of holding large stocks, it is no longer possible to have a sufficient amount to smooth the workload.

Factories are subject to many destabilising factors. These may come from fluctuations in demand, problems on the supply side and problems of reliability or quality within the manufacturing process and also—as we shall see—from outdated manufacturing rules. Together these guarantee that plants will be unbalanced: at different times and different places there will either be too little capacity, or too much.

Given this, it is useful to distinguish between two types of capacity imbalance, those that are *temporary* and those that are *permanent.*

In the typical western factory one of the main causes of temporary fluctuations is excessive batch sizes as defined by formulas that date back to the golden years of manufacturing and which recommend large batches as the most "cost effective". As these large batches go through the plant they generate local overloads and starve other work stations. Bottlenecks seem to move about from day to day. These are called "wandering bottlenecks".

What managers usually fail to realise is the *magnitude* of the structural imbalance in almost all factories. They cannot accept that a company is really a set of one or two constraints surrounded by resources with comfortable excess capacity, which is, however, hidden by day to day fluctuations in the work load, by piles of "work-in-progress" that clutter up the factory and by local performance measurement systems that force everybody to look busy (with targets such as "resource activation").

Phase 1 of Constraints Management implies facing up to the unavoidably unbalanced nature of modern factories and adapting rules and practices to reflect this.

In search of the ideal unbalanced plant

In Phase 2 of Constraints Management the aim is to optimise the distribution of capacities between different resources. This involves turning the inherited imperfect and unstable structural imbalance into one that is stable and efficient. To do this we must answer three questions. Which is the best bottleneck? What should its capacity be? What excess capacity should surround it?

Basically, answering these questions involves estimating the optimum trade-off between the cost of holding stocks and the cost of having excess capacity, both for the factory as a whole and for each resource. Since some machines cost more than others and since the costs of stocks vary from one stage of production to another, it follows logically and inevitably that optimising the distribution of excess capacity can and should lead to a structurally unbalanced plant.

With this reasoning the most likely "right bottleneck" will be the most expensive resource, but this will not always be the case once other factors such as the "stock requirements" of the resources have been taken into account. It is for instance inadvisable to choose as a constraint a resource that is unreliable, whereas a limited flexibility (a long set-up time) is on the contrary a recommendation. For the non-bottlenecks, their excess capacity will be essentially determined by their cost: a cheap resource will probably have a large amount of excess capacity. However, in certain cases, other

© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

factors have to be taken into account, especially in functions that are peripheral to production such as the design office, the billing service or the delivery system.

The links with [Lean Manufacturing]

In the same way that Henry Ford, Alfred Sloan and Frederick W. Taylor were the fathers of mass production, Sakichi, Kiichiro and Eiji Toyoda and Taiichi Ohno were the creators of a manufacturing philosophy that is better suited today's world of rapid change, pervasive uncertainty and an economic environment of weak growth.

The "Toyota Production System" [usually called Lean Manufacturing in 2012] they created aims to orchestrate the production process so everything happens "just-in-time". To this end they invented various techniques of which *Kanban* is the best known. *Constraints Management has the same objective but its synchronisation technique is different and indeed more efficient.* This conclusion—which may surprise some readers—emerges from the comparative study of the different techniques of synchronisation in Part Four of this book, which also tries to clear up some of the confusion and misconceptions in this area.

MRP and Constraints Management

This comparison also shows why Management of Resources Planning (MRP)—which embodies the West's approach to manufacturing and "pushes" products through a factory—can compete with "pull systems". All that is needed, in a world in which supply exceeds demand, is a mechanism that stops production at the appropriate moment. If MRP is operated in this way—asking it to "stop pushing" intelligently—its performance will improve, especially if the principles of Constraints Management are adopted at the same time.

[The above paragraph remains true but in the last 15 years there have been several evolutions one of them is that the ERPs (Enterprise Resource Planning such as SAP) systems now try and cover all the functions of a company and as a result the systems are so complex that the problems of MRP within ERPs is just one of many big problems. There is no correlation between the intensity of using ERPs and world class performance.]

Constraints Management: constrained flow

Constraints Management synchronises production by carefully planning the work of the constraints to best meet market demand, and then programming the other resources with intermittent work so as to feed the bottlenecks "just-in-time". This technique ensures a maximum volume of sales while restricting work in progress—and therefore the length of production lead times—to a minimum, the due date performance being guaranteed by the schedule of the bottleneck which has been established accordingly.

Constraints Management is in some ways a synthesis of the best aspects of the Japanese and western approach to which it adds its dual view. Bottlenecks are granted the favourable treatment they deserve, while excess capacity on non-bottlenecks is used to absorb fluctuations and disruptions which in a traditional balanced plant would require holding buffer stocks. To begin with these excess capacities are those that are already present in the factory, then, little by little, they are modified so as to get as close as possible to the ideal uneven distribution of capacity.

Just-In-Time…yes but…

The aim of all management techniques is to produce neither too soon nor too late. In practice two things make this impossible: the constraints that oblige a company to bring forward, delay or regroup the work to be done, and unpredictable random fluctuations due to internal production problems and to fluctuations in demand. Constraints Management is in a way the "yes but" of Just-In-Time, since it focuses on those things that prevent a company from reaching this admirable but ultimately unattainable target.

Just-In-Time for everyone

Companies that have tried to introduce Just-In-Time (JIT) know that it is a slow and painful process. As we shall see, Constraints Management is easier and faster to implement than other JIT

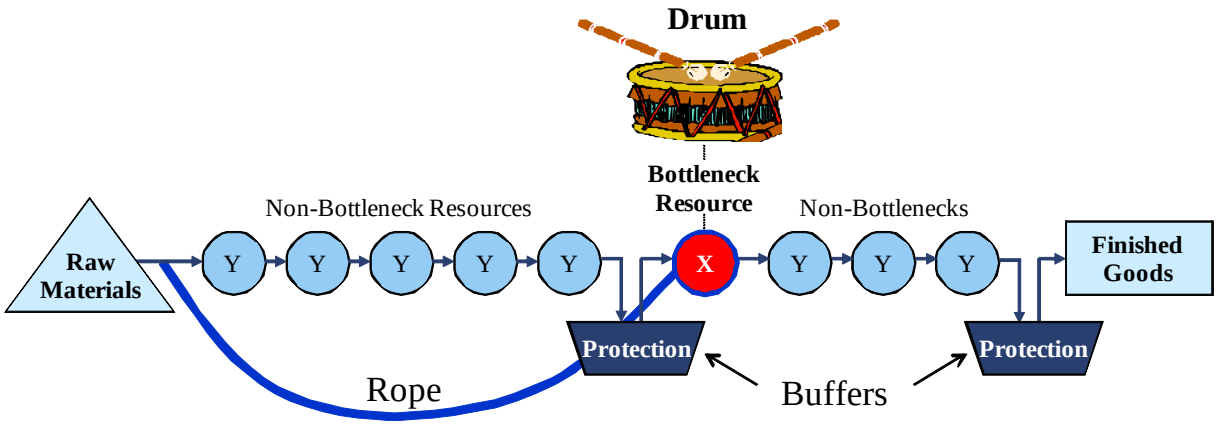
© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

techniques, since the product flow can be speeded up without requiring highly flexible and reliable resources. For this reason it should be of particular interest to companies that are lacking in this area.

Kanban, as conceived by Toyota, is really only applicable to repetitive manufacturing as, for example, in the automobile industry, whereas Constraints Management is of much wider application. With it, the philosophy of Just-In-Time production can be introduced in many places where this was thought to be impossible: continuous and discontinuous processes, medium or low volume productions, non repetitive production, etc.

Furthermore, although the discussion here is limited to manufacturing processes, the underlying logic is applicable to any organisation that creates products or services by carrying out a series of tasks using different resources. A design office [or an engineering department], for example, also has bottlenecks, queues of work-in-progress, obsolete work rules, and difficulties in synchronising the different tasks.

[The synchronisation technique: DBR or Drum – Buffer – Rope]



A focussed process of on-going improvement

The implementation of Constraints Management can quickly improve the competitiveness of a company, but to keep ahead of the competition a process of on-going improvement that attacks the root causes of problems is required. The need for buffer stocks can be further reduced by eliminating whatever it is that makes them necessary (quality problems, machine reliability and flexibility, etc.).

Constraints Management creates an environment in which to act by establishing two points of synchronisation that protect production volume and due date performance. This frees up people's time since they are no longer fully taken up by "fire-fighting": expediting overdue work, rescheduling, etc.

[But this can create a problem: Drum – Buffer – Rope enables a company to get good results in terms of Throughput and short lead times while buffering itself against most of its problems (machine breakdowns, poor quality, ...). This can lead to "falling asleep on your buffer" and slackening the tempo of the process of on-going improvement.]

The excess capacity on non-bottlenecks used to accelerate the product flow by absorbing peaks in demand or temporary overloads due to some internal problem will not be fully used. When things are running smoothly the work force will therefore have "non-production" time available which can be used to improve the production process. And the effectiveness of the improvements will be increased by the dual view that focuses attention on the problems that are the most costly to the company as a whole.

[But one of the most important things about TOC or Constraints Management is that it encourages one to focus the improvement actions on the constraints. It claims that you can do better than Pareto; by focussing on 1% of the firm you can get 99% of the results. Your Lean & Six Sigma actions should all be applied with a global view: the performance of a system is determined by its constraints. Focus on your one or two constraints. Don't waste time on your non-bottlenecks at the beginning. Their turn will come. Don't count the number Kaizen workshops you have concluded, you will only force people to solve problems that have little or no value for the firm as a whole. Look at your bottom line.

© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

[Increase your Throughput it's more important than reducing your Operating Expenses

One of the quarrels between the Lean and TOC clans concerns the question of reducing Operating Expenses or "Muda hunting". To put it succinctly: Toyota is a growth model. Those that practise Lean as an on-going process of headcount reduction are missing the point. I call this "Bad Lean". You must grow sufficiently fast to absorb your annual increases in productivity and in this way avoid headcount reductions. Too many TOC addicts claim that you should not try and reduce waste and operating expenses. I can't agree with this. Eliyahu Goldratt repeated incessantly "You must increase Throughput while simultaneously reducing Inventory and Operating Expense".]

Different types of constraints

The archetype of a constraint in a manufacturing company is the bottleneck machine, but other types exist. Some companies for instance have constraints on the supply side or in their design offices. In such cases the tactics will be modified accordingly but the basic reasoning remains the same. There is an on-going debate about wether "policy constraints" is a useful concept.

The case of the chronically under loaded company

More and more companies are facing chronically inadequate demand. In such circumstances a key feature of Constraints Management becomes highly relevant: how to best manage non-bottlenecks. Constraints Management is not only applicable to an overloaded company—it is more than just a polarisation on constraints—it also involves converting excess capacities, even those inflicted by the market, into a competitive advantage, with the aim of stimulating demand sufficiently to bring the bottleneck back from the market into the company. [This is now generally called S-DBR or Simplified DBR. Let me suggest another name just for the fun of it 1BR or One Buffer & Rope.]

The financial impact

From a financial point of view Constraints Management has many convincing arguments: significant improvement in cash flow due to stock reductions, the near elimination of unplanned overtime and other costs generated by poor synchronisation, an increase in turnover and the reabsorption of delivery backlog (by offloading bottlenecks using resources mistakenly regarded as obsolete or not cost effective). With regard to investments, Constraints Management does not waste money in an attempt to balance capacities since this is impossible. Instead investments can be redirected to more profitable areas. Indeed, at the end of Phase 1 companies often find that they possess large quantities of excess capacities and as a result some capacity expanding investment projects will be cancelled because it has become clear that they were in fact aimed at non-bottlenecks.

We reject, however, nearly all the financial and accounting concepts of the original OPT philosophy [generally now called Throughput Accounting or the Throughput World]. The idea that a product mix should be determined by the formula "money generated per bottleneck hour", for example, turns out to be a dangerous idea to be used only in certain limited circumstances.

If these ideas are so good, why have so few companies adopted them?

The first book to deal with unbalanced plants—*The Goal* by Dr. Eliyahu Goldratt, the founder of the movement—appeared in 1984 and was unusual in that it took the form of a novel. It became an immediate bestseller. [Over 5 million copies sold in 29 languages in 2012. Listed as one of the most important business books in modern times by Time magazine in 2011]. However very few companies have so far adopted this approach and deliberately run their factories in an unbalanced fashion. [The market share of TOC in 2012 is less than 5%.] There are several reasons for this.

First, this movement has been hindered by a particularly troubled and confusing history. Initially it was linked with some software called OPT [...]. It was moderately successful for a few years, but in 1987 Goldratt was forced to sell out [...].

Eli Goldratt's strategy of presenting them through a novel rather than a textbook was a stroke of genius that has since become very fashionable, but it does have drawbacks. He himself recognises that the book only deals with a part of the reasoning and that the missing parts are crucial. [...]

[Lean Manufacturing was promoted by a large manufacturing firm – Toyota – and this made it credible in industry. TOC does not yet have a large company that will claim that is uses TOC so industry remains sceptical.]

© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

[The word "Theory" in TOC isn't going to help. The business community is not a great consumer of theories.]

[In 2012 a new source of confusion has emerged: the Thinking Processes. This is a relatively recent new component of TOC that emerged around the turn of the century. It aims to help people to think better and thus help solve problems. It is very fashionable at the moment (2012) but it adds to the confusion because:

- A large part of the TOC community is now focussed on this aspect of TOC and yet with 10 years hindsight no important problems have yet been solved with this approach.
- The fundamental concept and importance of the constraint is not very present. It could be argued that the Thinking Processes are Goldrattisms (Eliyahu Goldratt's ideas) but that they are not really part of the Theory Of Constraints (if we take that label literally.]

A fresh start is needed

I have been involved for [over 25 years] now with this approach to industrial management, observing its evolution, the reactions it triggered, the verbal sparring of the experts for and against—and felt uneasy. Some things are undeniable, and especially the fact that today's factories are well and truly unbalanced, and that [many of them] have [physical] bottlenecks, be they fixed or wandering. But on the other hand it also seemed clear that some of the logic was flawed.

[Another important phenomenon emerged: the overwhelming "market share" of Lean Manufacturing (with origins in the Toyota Production System). This has led to a war of clans in which both sides reject the other approach. I believe on the contrary that Lean + TOC is an equation in which 1 + 1 = 3.]

[I am not sure which community is more clannish, Lean or TOC.]

For this reason I decided to take stock [in 1994] and try to identify the reasons that have prevented this school of thought from becoming established. Each proposition or claim has therefore been analysed, scrutinised and confronted with my own [29 year] experience in industry [...] in the course of my career as a management consultant. In doing so I have identified a certain number of errors, confusions, oversimplifications and omissions. Among these one stands out in particular: *the principles which determine the optimal distribution of capacities that a company should aim at have not, up to now, been identified.* It seems to me that this is the main reason why the "unbalanced plant" school of thought has never caught on. Until now the relatively few implementations have been limited to the management of existing bottlenecks (what I have called Phase 1) and could therefore only provide a one-off improvement since there was no reasoning available to define a long term strategy based on the search for the best disequilibrium (Phase 2). All the pioneers came in time to an impasse.

[I therefore question one of the founding pillars of TOC usually referred to as the 5 Focussing Steps or the Process Of On-Going Improvement (POOGI):

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.]

Two things are needed to remedy this situation. First, a thorough review of all the elements in Phase 1, from theory to practice, including an objective assessment of the weak points [...]. Second, the keystone—Phase 2—had to be developed to make this movement more than just a technique of eliminating successive bottlenecks. These are the two objectives of this book.

What name to use: OPT, TOC or Constraints Management?

A new name [is] necessary since what is presented here is both more and less than [...] TOC. Less because some elements are rejected, more because [a] key missing element has been added: how to choose the best structural constraint and the optimal amount of excess capacity for non-bottlenecks. A new name has therefore been chosen: Constraints Management.

© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]

The structure of the [first edition of the] book

[A completely revised second edition of the book is currently being written and will probably be published in French and in English. In this new edition one of the major changes will be the importance accorded to TLS (the integration of TOC, Lean & Six Sigma).]

The first part of the book describes the background: how, in the West, good times led to bad management, while the Japanese developed a new industrial strategy that turned out to be far more efficient. We then explain why all factories have become unbalanced, why the school of thought that recognised this remained marginal, and conclude with a definition of Constraints Management.

The second part lays out the two facets of the theory. The first half explains how to manage an existing unbalanced plant: the basic manufacturing rules that are the foundations of the approach, the synchronisation technique, how to open up bottlenecks, how to manage a process of on-going improvement, the impact on performance measurement systems, how to forecast and prepare an unbalanced factory's activity, accounting in the presence of constraints and the different types of constraints that can be encountered other than the traditional bottleneck. The second half presents the reasoning that should be used to guide investments in such a way as to get as close as possible to the optimally unbalanced plant: how to identify the right bottleneck and decide what quantities of excess capacity should surround it.

The third part deals with how to put the theory into practice. It includes a case study in which we start with the initial analysis, and goes on from there to study how the existing set of constraints should be handled and how the company should invest to further improve the situation.

The fourth part analyses the similarities and differences between the Japanese approach (as represented by the Toyota Production System), MRP and Constraints Management. This comparative study shows how all three aim to produce "Just-In-Time" and how Constraints Management can be used to enhance the performance of the Toyota Production System and that of companies using an MRP system.

An overview in less than 30 pages is possible by reading chapters 2, 5 and the conclusion.

Other sources of information in English:

- LinkedIn Discussion Groups:
  - TLS - TOC Lean & Six Sigma: http://www.linkedin.com/groups?gid=2348143&trk=hb_side_g
  - TOC4U Theory Of Constraints: http://www.linkedin.com/groups?home=&gid=84002&trk=anet_ug_hm
- Dedicated Constraints Management website
  but mostly in French: http://management-par-les-contraintes.com
- If you liked this text you really should read the novel *Epiphanized*
  by Bob Sproull & Bruce Nelson: http://www.amazon.com/Epiphanized-Integrating-Theory-Constraints-Sigma/dp/0884272052/ref=sr_1_1?ie=UTF8&qid=1353075582&sr=8-1&keywords=epiphanized
- A fairly complete and up to date bibliography: http://management-par-les-contraintes.com/fr/Bibliographie-46.html
- Marris Consulting website currently mostly in French: http://marris-consulting.com

About the author

Philip Marris is the owner and founder of Marris Consulting, a management consultancy based in Paris created in 2005 and focused on industrial operations (Production, Supply Chain, Engineering & Design and Project Management). The company motto: Factories, People & results.

He is a Theory Of Constraints specialist with over 25 years of TOC. He worked with Eli Goldratt in 1986 in Creative Output. He is heavily involved in the "TOC + Lean" or "TLS" (TOC + Lean + Six Sigma) movement.

Philip Marris was in charge of Manufacturing Operations in France and in Europe in large consulting firms (Capgemini Consulting, Bossard Consultants, CG Ernst & Young). He has over 25 years of experience in industry and in consulting.

Philip Marris started his career in 1982 as a production engineer in the steel industry in France.

He is English and lives in Paris and is bi-lingual and bi-cultural.

His LinkedIn profile: fr.linkedin.com/in/philipmarris

© Marris Consulting. Translation and a very rough update by the author of the Introduction to the book
Le Management Par les Contraintes en gestion industrielle (Editions d'Organisation, Paris, France, 1994, ISBN 2-7081-1666-5).
Paris, 16th of November 2012 [MPC Intro Ed 1 UK V1.42 20121116]