

# 如何提振企业经营业绩， 实现快速无风险转型升级

共创物联网&高德  
绿建  
Marris  
Consulting  
2020.01.21

# Agenda

- Introduction
- Presentation of the Theory of Constraints  
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- The Theory Of Constraints in production
- The Theory Of Constraints in projects
- Conclusion
- Annexes

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## A webinar organized by our strategic partner SupplyWe

- Following a conference in Guangzhou in 2017, Philip Marris has developed a strong relationship with several people active in China in operational performance improvement.
- These connections have led to the creation of a partnership between SupplyWe and Marris Consulting.
- Both organizations share common values, in particular an obsession with producing remarkable results.
- Both often use a combination of Lean, Theory Of Constraints, Industry 4.0 and other management methodologies.
- We are very honored to take part in this first event together.



*Attendees and speakers of the Theory Of Constraints Practitioners Alliance 2017 Conference in Guangzhou*

## Philip Marris: CEO, Marris Consulting

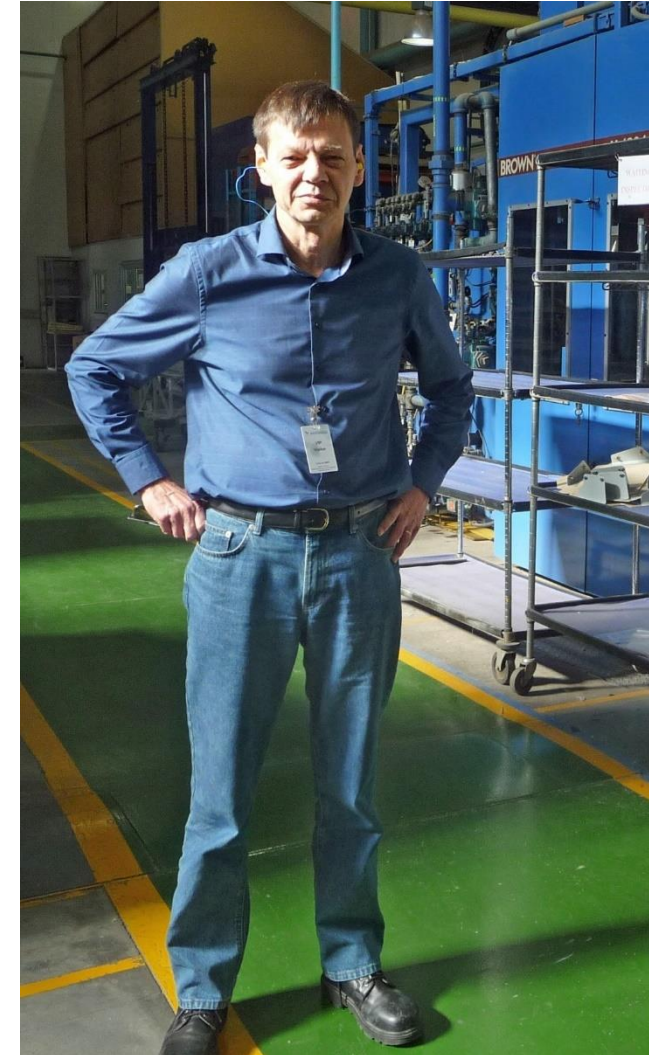
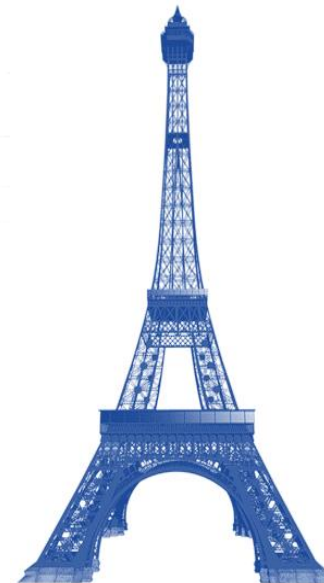
- English but based in Paris, France.
- Started using Lean in industry in 1984.
- Has been implementing ToC since 1986, when he worked with Eli Goldratt, the founder of Theory of Constraints/ToC.
- Author of the French reference book on ToC in production: *Le Management Par les Contraintes*.
- Founder in 2005 of Marris Consulting.
- Implementation of ToC and Lean in more than 260 companies in over 30 different countries in the world.





# Marris Consulting, a consulting firm specialized in operational excellence and project management

- Based in Paris but operates worldwide:
  - *France, Switzerland, England, Spain, South Africa, Mexico, China, Czech Republic, Romania, USA, Vietnam, etc.*
- 12 consultants and its network of partners.
- More than 40 conferences and training sessions per year.
- Over 300 videos of customer testimonials, educational presentations, expert interviews, etc.



# Experience of more than 260 business transformations worldwide



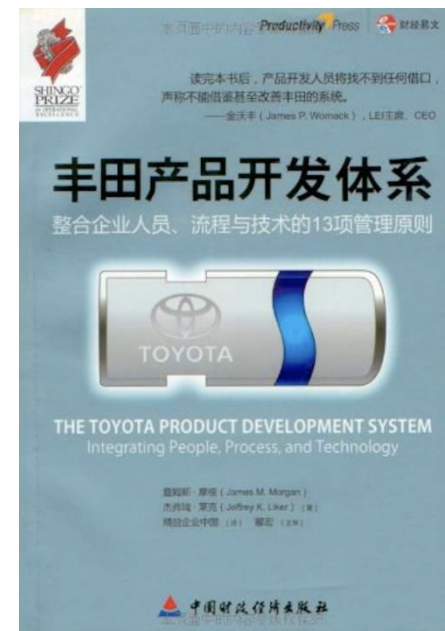
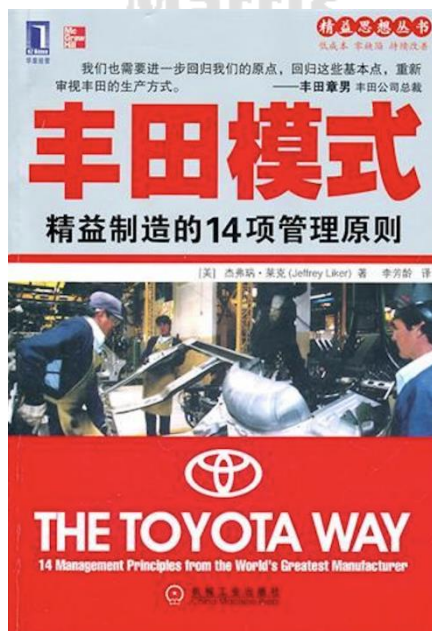


# We mainly use Lean and Theory Of Constraints but in this webinar we will concentrate on ToC

- Lean is the most widespread operational performance approach in the world.
- For this reason you probably already have some knowledge of Lean.
- The Theory Of Constraints is much less well known.
- So, in this webinar, we will not describe the Lean approach. We will focus on the Theory Of Constraints.

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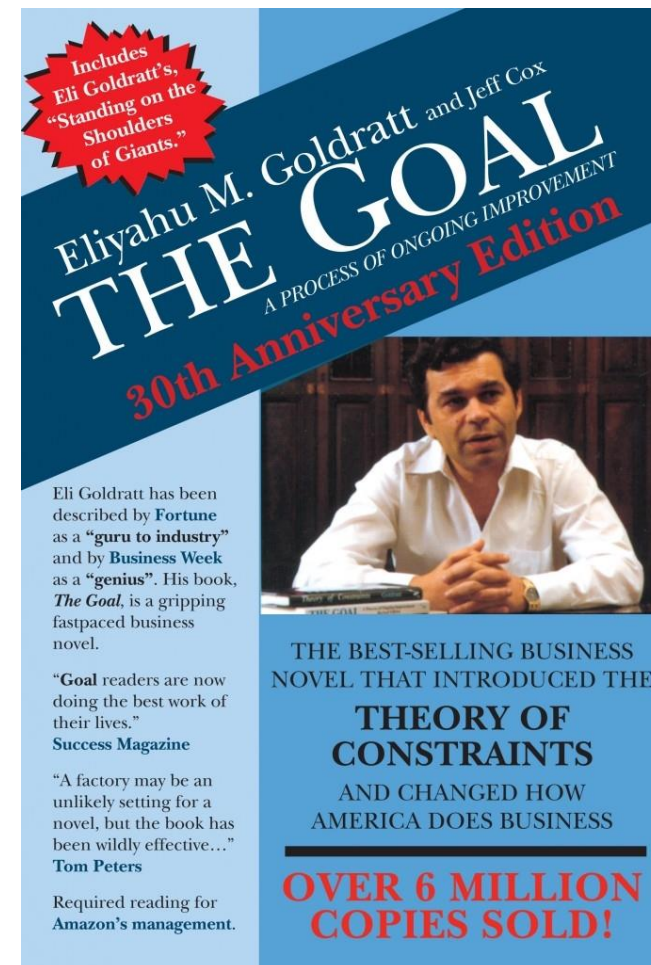
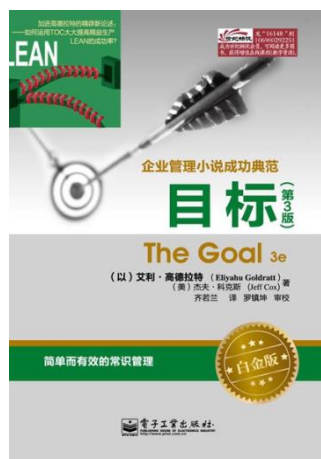




# The Theory of Constraints gained its global recognition thanks to the success of the best selling “business thriller” *The Goal*

- Over 8 million copies sold in 32 languages. Mandatory reading in most universities/MBAs/...
- The first book of its kind: a novel to explain a new approach to management.
- Chosen as one of the 25 most influential business books by Time magazine in September 2011.
- Used by Jeff Bezos, Amazon.com CEO, to build their Supply Chain and redefine the company's goal.

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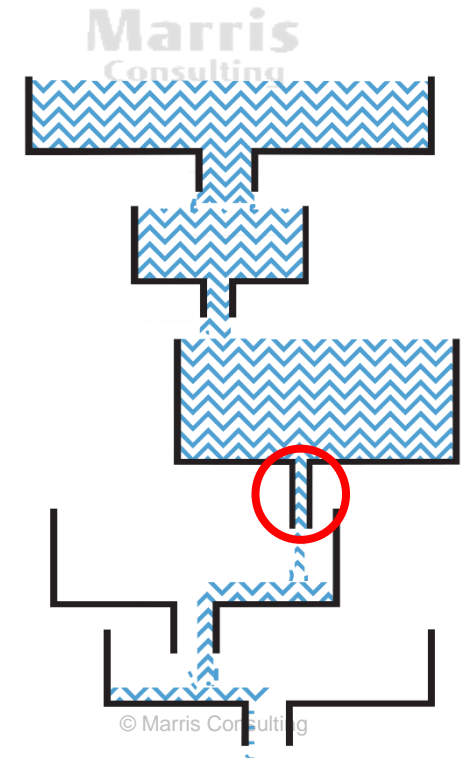
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# Focus on improving the system constraints that determine the overall performance

*It is no longer possible to distribute work equitably:  
organizations are necessarily unbalanced*

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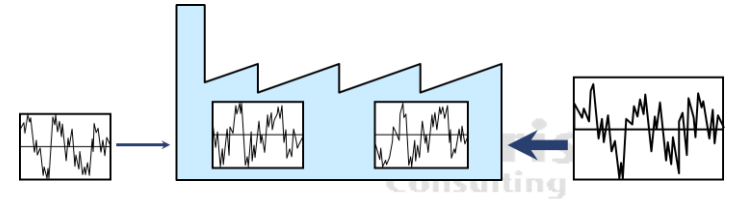
- Annual budgets pretend to balance organizations but they don't succeed.
- There is always a constraint somewhere in the system.
- One hour lost on that constraint (the bottleneck)  
= one hour lost for the system = one hour of lost sales.
- One hour gained on a non-bottleneck is an illusion. A non-constraint must only work according to the constraints requirements.
- A dual view is mandatory: different rules for constraints and non-constraints.



*The sum of local optimums is not equal to the global optimum*

# The Theory Of Constraints is more and more pertinent

- The external environment is changing too fast for the company to be able to adapt its internal local capacities.
- Companies can no longer buffer themselves against fluctuations by buffer stocks since these increase inertia, risk becoming obsolete and have a significant financial impact.
- So constraints are getting harder and harder to avoid.
- And the other resources (the non-constraints) have more and more excess capacity.





# The Theory Of Constraints' continuous improvement process

1. IDENTIFY the system constraint(s).

Easy to do in production  
but not in projects

2. Decide how to EXPLOIT the system constraint.

Without investments  
in \$ or in time

3. SUBORDINATE everything else to the above decision.

The most  
difficult step

4. ELEVATE the system constraint

With investments  
in \$ or in time

5. WARNING!!!!

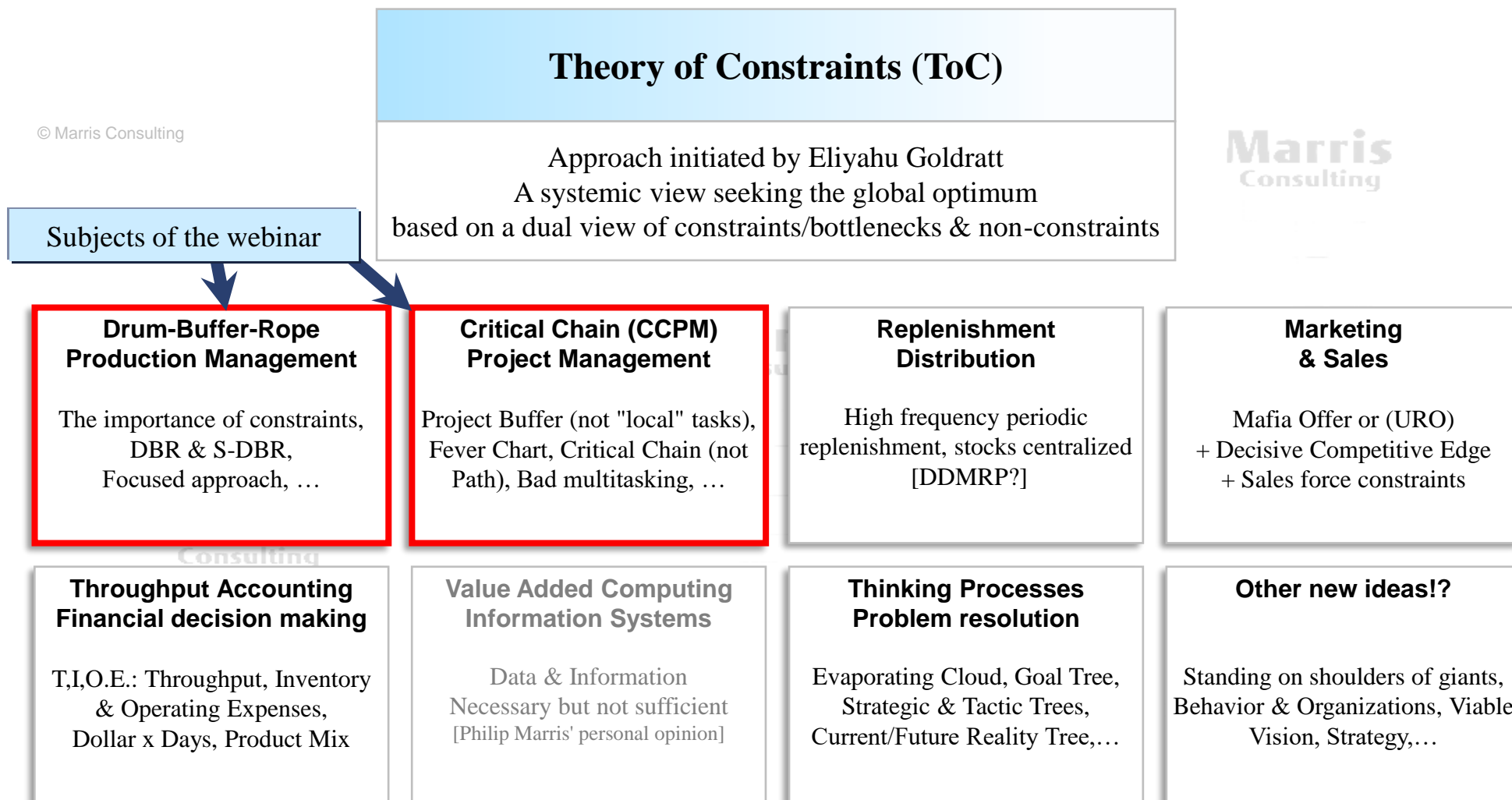
If in the previous steps a constraint has been eliminated,  
go back to step 1,  
but do not allow INERTIA to become the system constraint.

Or choose the "best"  
constraint of the system

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Note: often called *The 5 Focusing Steps* or *ToC Process of On-Going Improvement (POOGI)*.

# The different components of the Theory of Constraints (ToC)



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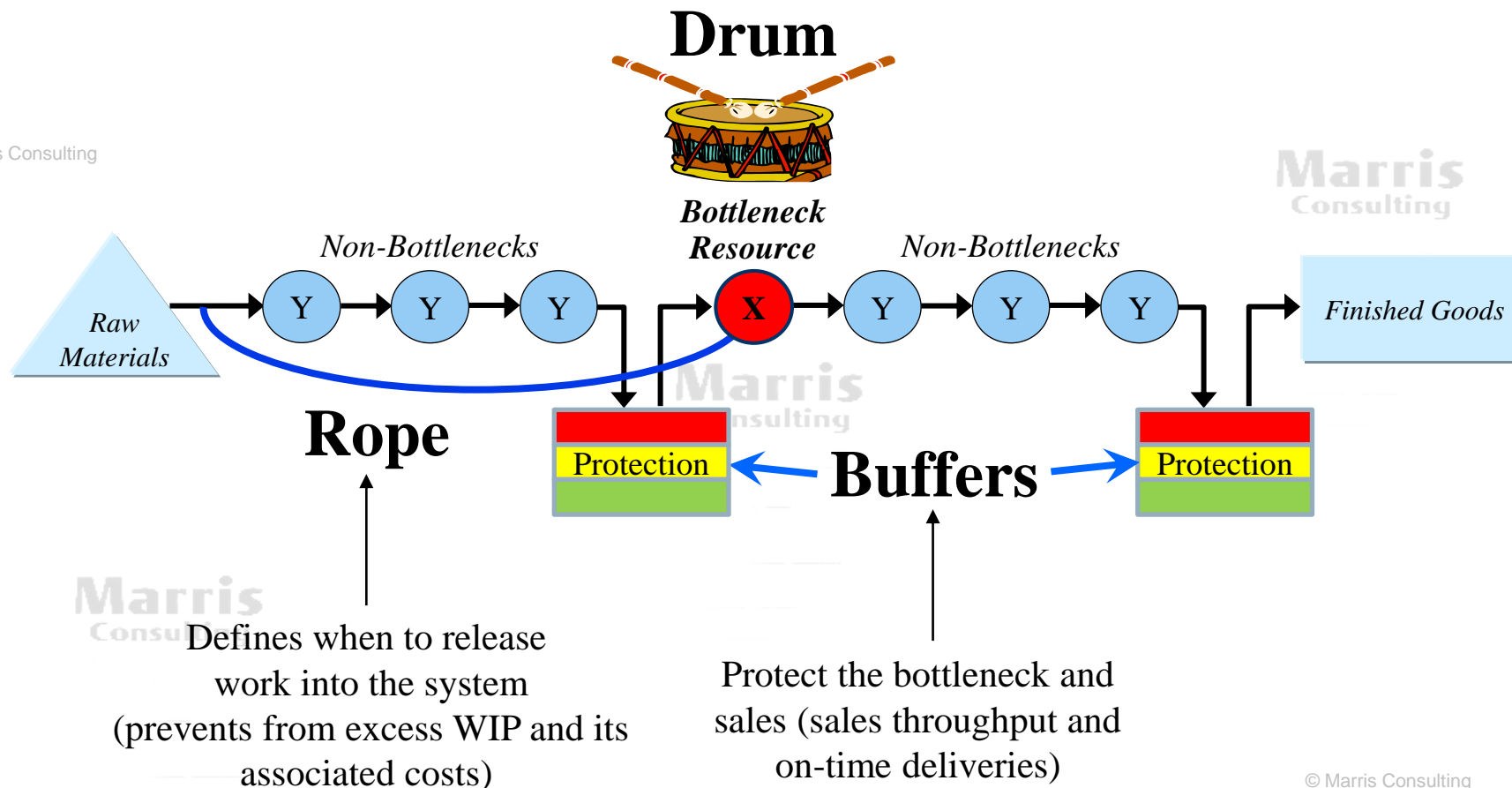
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# ToC controls production flow with the Drum Buffer Rope (DBR) mechanism

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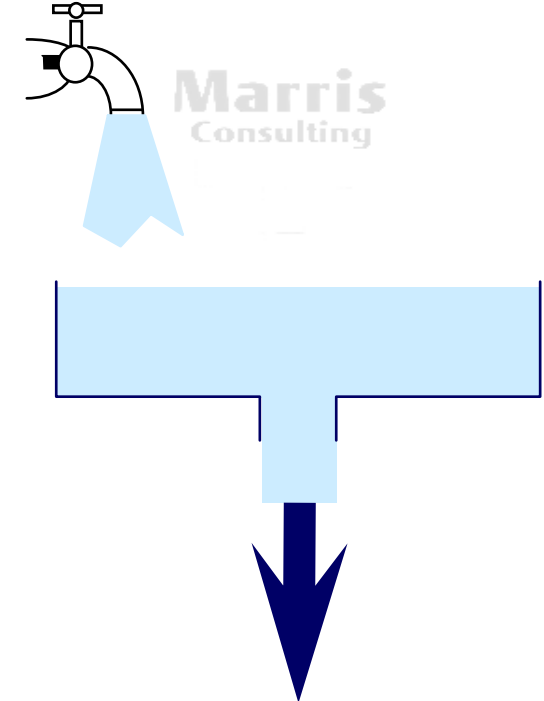


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*One of the key ideas of ToC is to use buffers to protect the bottleneck against variability. We will find a similar mechanism in the ToC project management approach.*

# Both Lean and TOC emphasize that the level of Work In Progress (WIP) should continuously be reduced

- Little's Law is a crucial concept, simple and yet not often understood:
  - The process durations are proportional to the quantity of work in progress
  - If  $V$  = volume of reservoir = WIP in the system and  $R$  = Rate of flow = production rate
  - Then the **average lead time is  $LD = V/R$**
- Thus by dividing by 4 the WIP, one should be able to reduce by 4 the Lead Time.
- We recommend using the “2 for 1” rule: you can launch one new item in the system only when 2 items have been completed.



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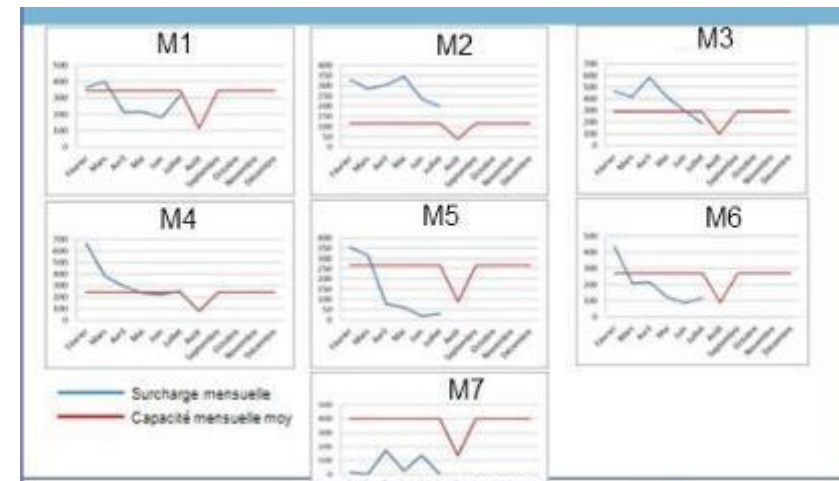
# *Flight Control Systems Equipment Manufacturer:*

## They thought several machines were their bottleneck

- This 400-person factory had very bad On-Time Delivery performance.
- They had to solve this problem or their factory would be closed down.
- The plant does not have a credible action plan to rectify the situation towards its customers.
- A lot of money was already being spent to increase production output (overtime, extra staff, subcontracting, ...).



Evolution of the delay on bottlenecks machines during machining

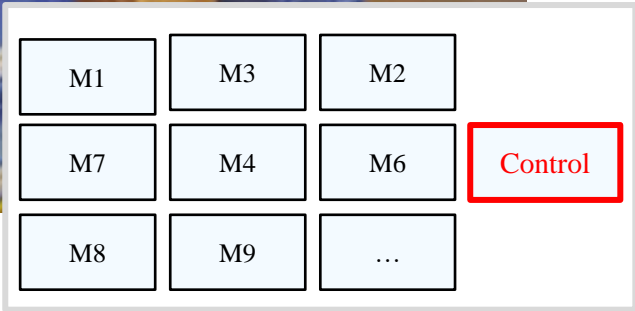




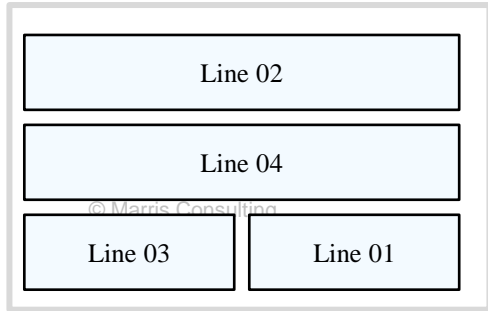
# ...In reality, the bottleneck of the factory was the quality control of the parts



- Products waiting before Quality Control:
- 370 Work Orders (35%)
  - 8 out of 10 "Urgent orders"



Machining



Assembly

## Two main complementary projects were launched simultaneously

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### **Action #1 :** ***Exploit the constraint***

- Management attention
- Silly small investments (such as a new photocopier...)
- Increased Manpower (by transfers from non-bottlenecks, not extra labour)
- Increase the local productivity of the control thanks to improvement and managerial actions:
  - Remove redundant checks done upstream,
  - Reorganization of controllers to remove unnecessary flows,
  - Relocate some controls at the subcontractor's level.

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### **Action #2 :** ***Subordinate & Reduce WIP***

- Apply the "2 for 1" rule
- Prevent production from scheduling to ensure local productivity.
- Focus the efforts of the support functions (methods, quality ...) on the resolution of the priority Work Orders.
- Do not launch WOs to keep the machines busy
- ...

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As a result, WIP and production Lead Times were reduced by 80% and productivity increased by 30% in 2 weeks

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**Before**

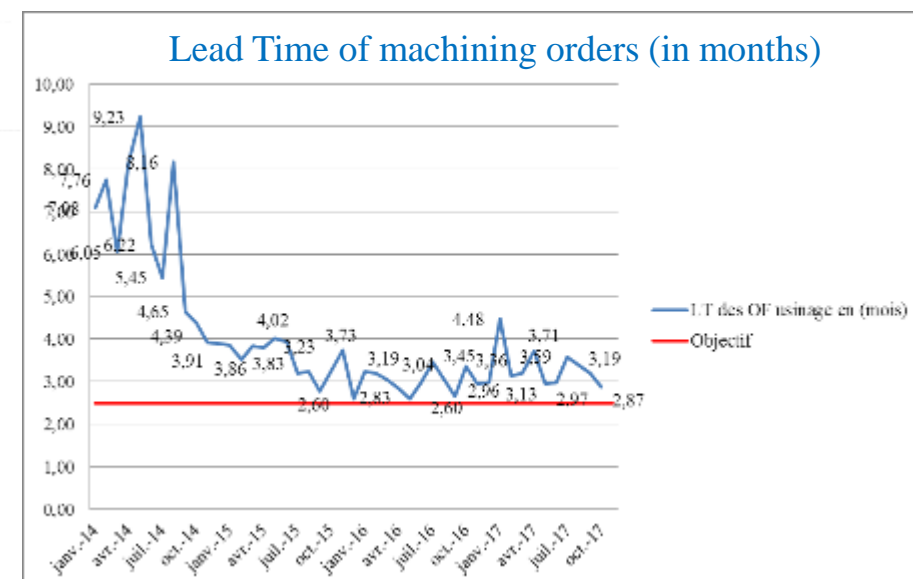
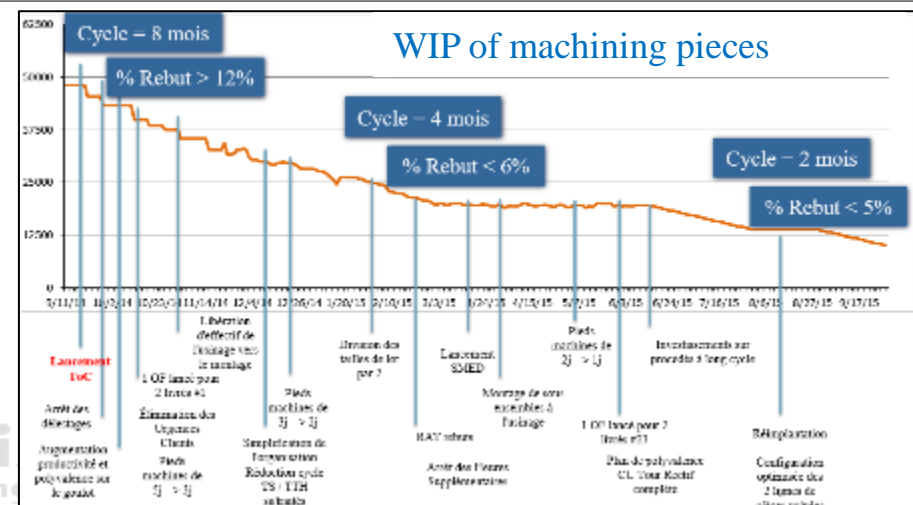


**After**

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# The factory quickly went from being the worst to the best in the group

- The On-Time Delivery performance rapidly increased.
- The plant won the group's 2016 performance and competitiveness awards.
- The site won the best supplier award from its main customer Airbus.





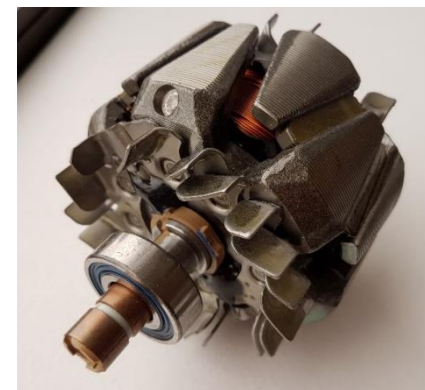
# Theory Of Constraints alone will bring limited improvements

- Lean and Theory Of Constraints are not that different in their purpose:
  - They both aim at improving the flow
- A significant difference is their attitude towards variability
  - Lean and Six Sigma consider that you can eliminate variability
    - Hence a "zero stock" logic
  - TOC considers that you cannot totally eradicate variability
    - Hence a buffer logic
- Nevertheless, they are compatible and even more powerful when combined
  - Use TOC to identify the constraint and therefore where to focus
  - Use Lean or any pertinent method to improve the performance of the bottleneck

***TOC = LEAN = FLOW***

## One of the Leanest organizations in the world

- One of the 10 largest automotive OEM suppliers in the world. Over 100 factories.
- All the Lean techniques are used: Gemba, SMED, PDCA, 5S, ppm, Andon, Poka Yoke, Kanban, VSM, VSD, 8D, ...
- The plant, 1000 employees, manufactures alternators. It is made up of twenty autonomous production units.
- Following an excellent positioning of their products, one of their factories in Mexico ended up with a demand significantly higher than its capacity. This situation created great tension with their customers.
- Of course, they went 5 x 8 (24/7), they launched several investments in new lines, but these had lead times of more than 6 months

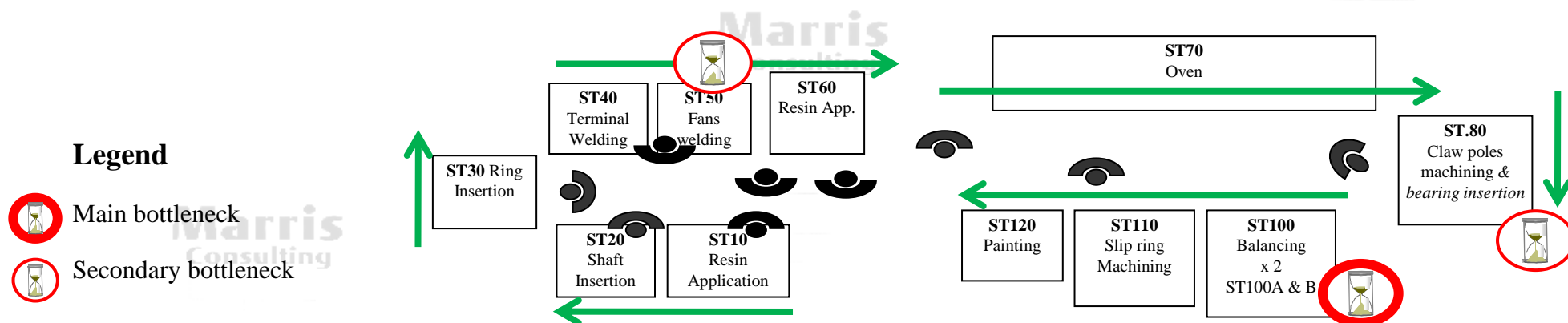


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*The problem to be solved:  
how to increase the volumes of factory shipments almost immediately?*

## We will focus on one of the bottleneck APU's

- Daily production 6 000 units per day = cycle time 15 seconds
- The system is standard Lean: One piece flow, the O.E.E.s are approximately 70%, Quality is O.K.
- The bottleneck was already formally identified

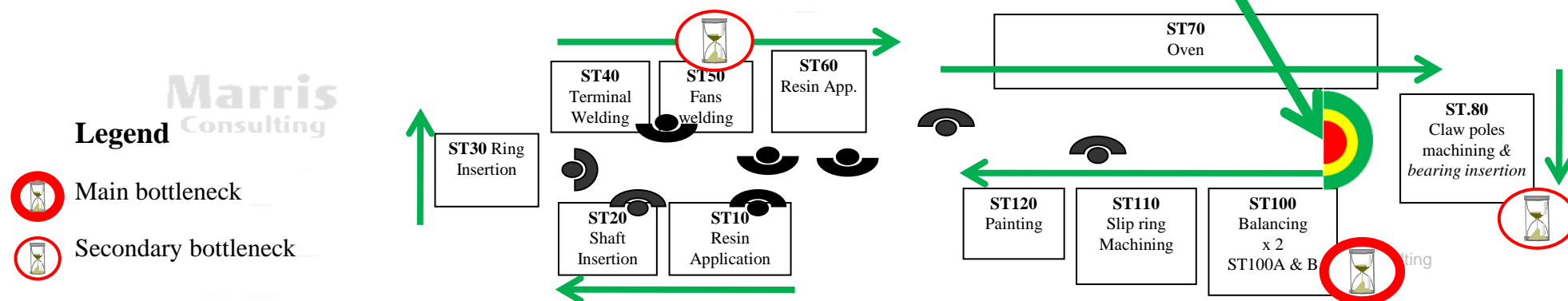


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*How to increase throughput by more than 15% in less than 15 minutes !?*

## The solution: protect the **bottleneck** with a buffer!

- A buffer, initially of about 12 parts, was implemented just in front of the bottleneck operation. This protected the bottleneck from micro stoppages lasting between 1 second and 3 minutes.
- **This immediately increased the Throughput and the overall plant productivity by 17%.**





# And in the following weeks, the performance was increased even further

## ■ On the bottleneck:

- “25-hour” per day production: breaks, shifts, lunches, etc...
- Priority maintenance (preventive and curative),
- Improvement of the production process (sometimes less than a second but ...),
- Etc.

## ■ On other non-bottleneck resources:

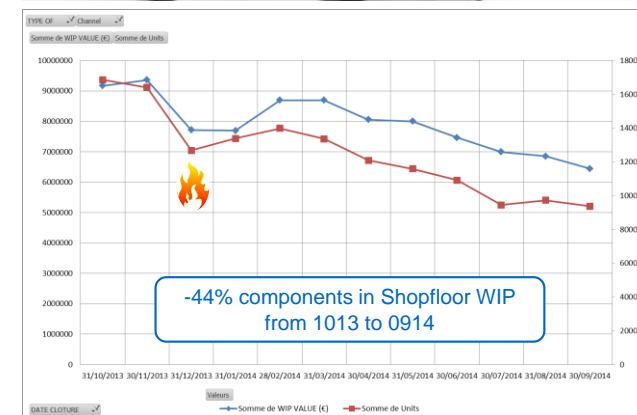
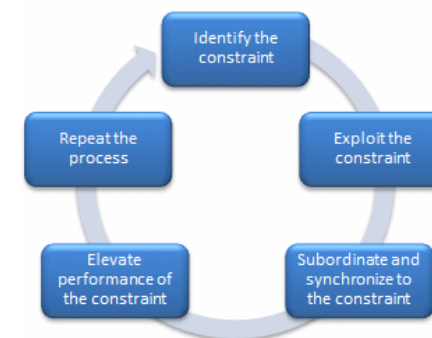
- Reduced scrap rates
- Reduction in the number of long breakdowns
- Etc.



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# Improvement of the service rate within a factory from the world leader in the manufacture of bearings

- A fire devastated a good part of the work in progress and some production machines
  - The bearing manufacturer had to shut down its workshops for more than 5 weeks.
  - This situation quickly became dangerous for its customers who could increase the supply share of parts from the competition.
- The constraint of the factory was the production of cages:
  - Identification of “bottlenecks” machines: drilling and broaching
  - Reinforcement of versatility,
  - Focus of support functions: maintenance, engineering, quality,
  - Control of subcontractors
  - Deployment of LEAN tools: Daily Meeting, SMED, 5S, etc.
  - Re-configuration of the ERP
- The lead time went from **122 days to 68 days**, the level of **WIP decreased by 44%** and **throughput increased by 21%**



# Service times divided by 2 thanks to TOC within a major player in fast food industry

- The brand's restaurants are experiencing a drop in performance
  - Following the change in the production process, a new model that cannot be changed
  - Facing ever more pronounced demand peaks,
- The brand decided to understand the problem from a “flow” point of view in regards of 2 objectives
  - Continue to satisfy their customers
  - Find satisfactory performance,.
- The diagnosis and analysis of new production platform allowed us to:
  - Identify the constraint slowing down customer service time, linked to desynchronization of flows
  - Identify the second blocking point revealed by the elimination of the first constraint
  - Then, several operational improvements were conducted: better understanding of tools, better production scheduling, reinforcement of managerial practices and focus on the constraint
- The Service times **decreased up to 60%, losses divided by 10**, number of customer returns **divided by 7 in a few weeks**, level of stress decreased, etc.
- The solution is fully integrated in the new standards and training and is being deployed at national level



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# Why you should consider to implement Critical Chain Project Management (#1/3)

- Numerous studies show that projects performances are often poor:

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• in average 40% of projects finish late, over budget and do not respect the initial specifications of the project

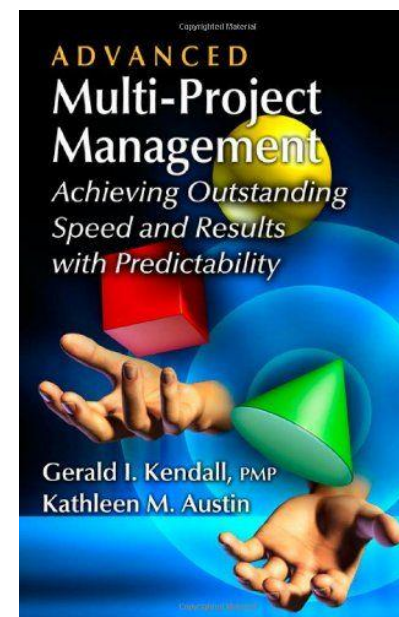
- On the other hand, Critical Chain Project Management has demonstrated its ability to improve performance:

%On-time	%On-scope	%On-budget
59 %	62 %	62 %

Source: P2 Consulting - Industry trends project management survey 2015; PMI - Pulse of the Professions 2016; Wellington Study - The state of project management survey 2016

Results	Average	Worst case	Best case
Project duration	- 39%	- 13%	- 78%
Number of projects completed in a given time	+ 70 %	+ 15%	+ 222%

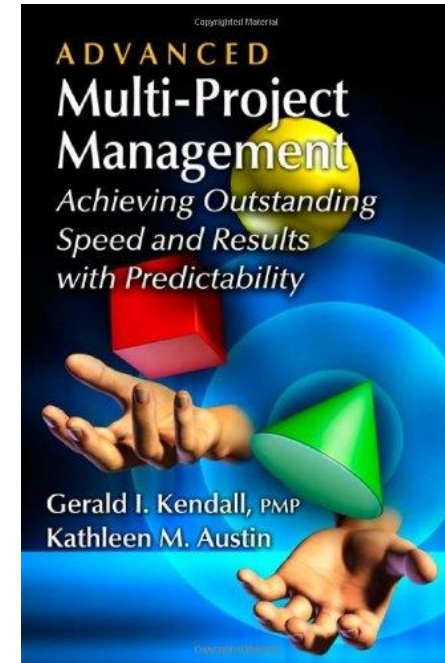
Source: “Advanced Multi-Project Management Achieving Outstanding Speed and Results with Predictability” 2013 book by Gerald I. Kendall & Kathleen M. Austin, page 95. The analysis is based on public information available concerning 60 different organizations working in different industries that had applied CCPM.



# Why you should consider to implement Critical Chain Project Management (#2/3)

## ■ >350 reasons to consider CCPM:

3M, ABB, "ABB AG, Power, Tech. Division", ABB Cordoba, ABB Halle, Abbott Labs, Acccoat, "Action Park, Multiforme Grupo", Adirondack Oral & Maxillofacial Surgery, Advanced Energy Technology, Advasense Technologies, Aerojet Corporation, Agilent Technologie, AHIS-St. Vincent Health, Air Force Institute of Technology, "Airgo Networks, (Qualcomm)", Airshow Inc., "Alcan Alesa, Technologies", Alcatel, Alcatel-Lucent, Alfa Lava, Alna Software, AMCC, AMD, Amdocs, American Rubber Products, AMGEN, Andover Healthcare Inc., Applied Plasmonics, AREVA, Arterain Medical, Atomic Energy of Canada Ltd., Avaya, Avitronics, BAE Systems, Balfour Beatty, Barco, Baxter, Bell Canada, BHP Billiton, Bimba Manufacturing, Boeing (Military), Boeing Space & Intelligence Systems, "Boeing Wing, Assembly", Bosal, Bosch Rexroth Ltda., Boston Scientific, Bovis Pharmaceuticals, BP Oil, Brice Manufacturing, BT Radianz, BVR Technologies Company, C.F. Roark Welding & Engineering Co. Inc., C.N. Cotrentes, CAE USA, "Californie, Department of Corrections", Callaway Golf, Celite Corporation / World Minerals Columbia Industries, Celsa Group, Central Dupage Health, Central Nuclear Almaraz Trillo, Chrysler, Clopay, Coca-Cola, Colgate Palmolive, Computer Sciences Corp, Confluence UK, Conoco, Converge Medical Inc., Corning Cable Systems, Cray, Inc., Cueros Industrializados del Bajío S.A., Cytori Therapeutics, Inc., DaimlerChrysler UK, Danfoss, Danisco (Genencor), Del Monte Foods, Delta Air Unes, Inc., Delta Faucet Company, Detroit Diesel Reman-West, Dr. Reddy's Laboratories, DuPont, e2V Semiconductors, Eastman Kodak Company, ECI Telecom Ltd., Eclozion Informatique, Edwards Lifescience, eIRcom, Embracer, emcocables, Emesa, Erickson Air-Crane, Ericsson, Estonian Telephone, Ethicon, ExxonMobil Chemical, Fairchild Semiconductor, Fisher Controls, Fluid Brasil Sistemas E Tecnologia, Fluke Corporation, FMC Technologies, Fonterra, French Air Force, Fuel Cell Energy, Gambro Healthcare, GE Industrial Systems, General Dynamics, Gillette, GlaxoSmithKline, Graftech, Hach, Halliburton, "Hamilton Beach, Brands, Inc.", "Harris, Semiconductor", Hawker Beechcraft, Heineken, Heineken, Spain, Henkel, Hewlett Packard, Hitachi Computer Products, Honda, Honeywell, "HP Digital Camera, Group", IBM, IKEA Trading und Design, Ismeca Europe Semiconductor, "Ismeca, Semiconductor", ITT Canon, ITT Corporation, ITT Space Systems, Johnson & Johnson, Kawasaki Heavy Industries, Ltd., Kraft Foods, L-3 Communication Systems, "LeTourneau, Technologies Inc.", Lockheed Martin, Lord Corporation, LSI Logic, Lucent Technologies, M&M Precision Systems, Marshall Industries, Marvell, McKee Foods, Medtronic, Medtronic, Europe, Medtronic, Inc., Merck Medco Managed Care, Merichem Chemicals & Refinery Services, Microsoft, Milwaukee Forge, Motorola, NASA, Nike, Northrop Grumman, Numonyx, Oregon Freeze Dry, Owens-Illinois, "Oxford-Radcliffe, Hospitals, UK", P&G Pharmaceuticals, Pharmacia, Philip Morris, Philips Semiconductors, Pioneer, Portsmouth Naval Shipyard, Puget Sound Naval Shipyard, Qualcomm, Railcare Wolverton, UK, Raychem, Raytheon, Rex Materials Group, Roche Diagnostics, Rolls Royce, RSA Security, SAAB Avionics, SanDisk, Sapient, Seagate Technology LLC, Shea Homes, Siemens, "Siemens Generator, Engineering", Skoda Power, Skye Group, Sony Ericsson Mobil Communications, Spectranetics, Spirent Communications, Spirit Aerosystems, Sprint, Sun Microsystems, Sylvania, Symbian, Tadiran Spectralink, Tata Steel, Tecnobit, Tektronix, Tellabs, Tenet Health Care, The Boeing Company, ThyssenKrupp, Timco, Tripod Data Systems, Inc., TRS Refrigeration, TT Technologies, Tundra Semiconductor, Tyco Electronics, Tyco Healthcare, U.S. Air Force (multiple bases), "U.S. Army Fleet, Support", "U.S. Army, Corpus, Christi", "U.S. Marine Corps, (Multiple bases)", Unilever, United Behavioral Health, UPC Technology, US Air Force, Valley Cabinet Works, Vascore Medical, Ventana, Volvo, Von Ardenne, Workscape, Xerox Corporation.




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# Why you should consider to implement Critical Chain Project Management (#3/3)

- The PMI 2019 Best Project Of The Year was awarded to Embraer for developing a new airplane using Critical Chain and breaking many industry performance records.


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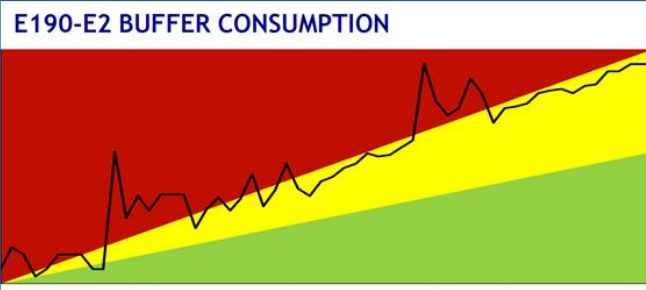
## Best project of the Year 2019 Award




### E-Jets E190-E2



Using  
**Critical Chain**  
Project Management  
approach



Schedule reduction was of 22.5 months



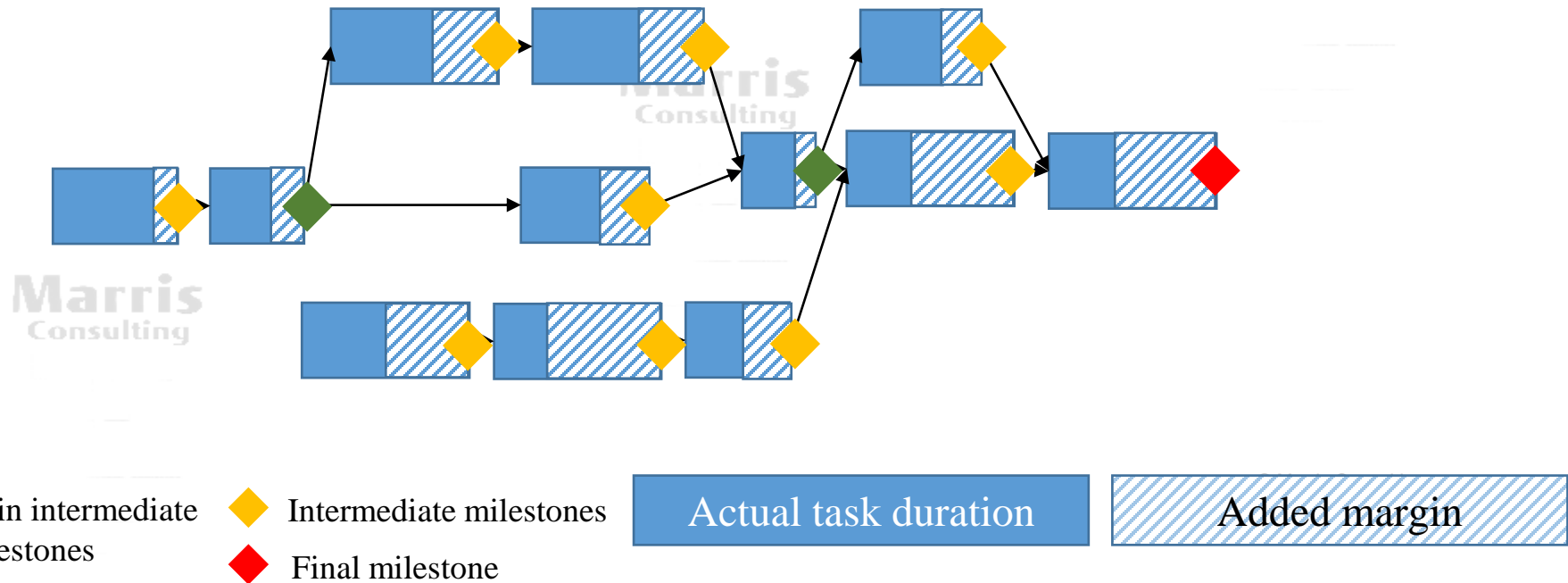
\* *Project Management Institute, international association of 1,000,000 members*

# Project managers try to compensate for the uncertainties inherent in projects

- Commitment on dates for each task completion
- Micro-management and more and more detailed schedules
- Local margins added to each task duration

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# The Critical Chain method aims at protecting the whole project, not the individual tasks

- All project tasks have significant security margins, but they are wasted.

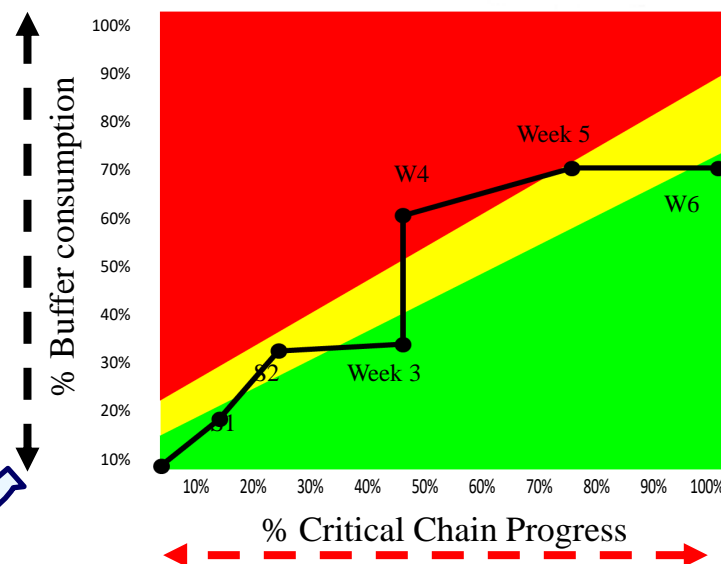
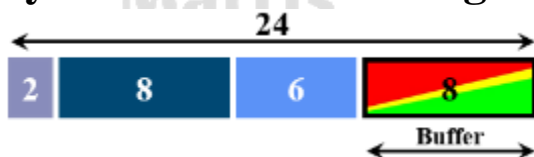
With traditional planning...



... each task has its own margin



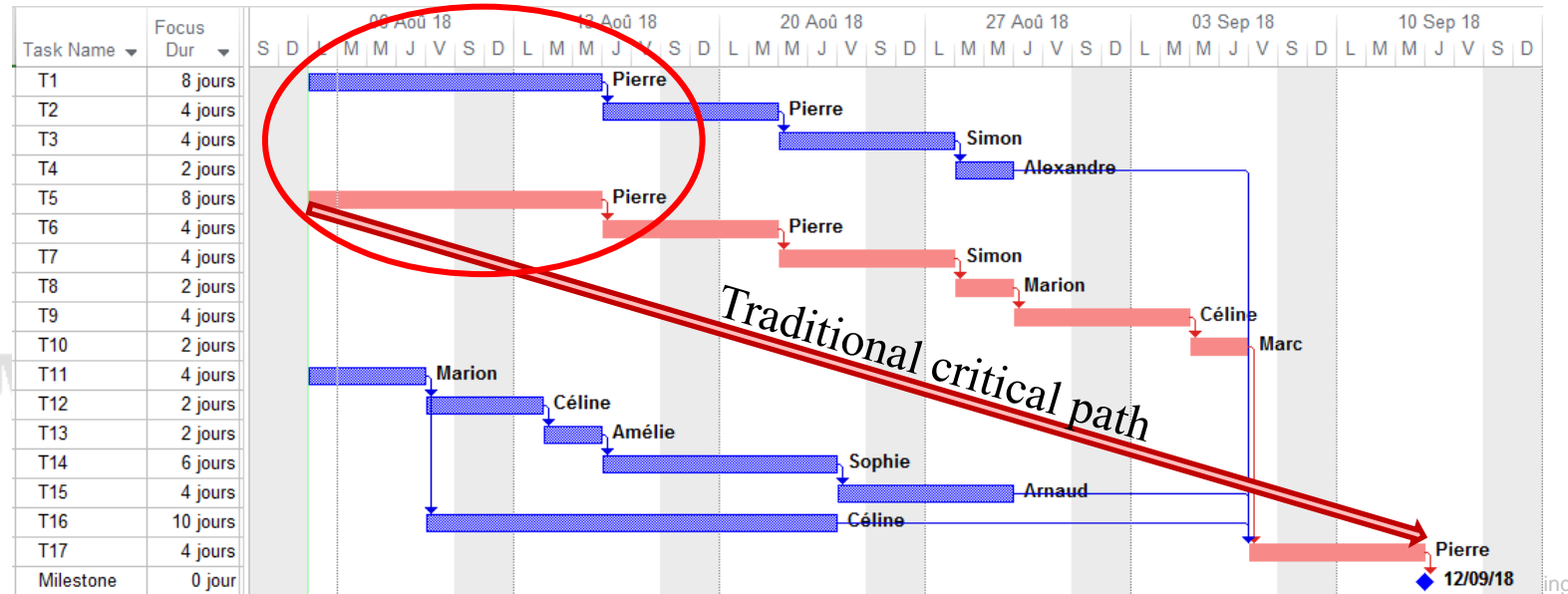
With Critical Chain, margins are mutualized and cycle times are challenged



*Accepting the inherent uncertainty of projects is a key point of CCPM*

# Unlike traditional approaches (such as the critical path), a CCPM planning is based on finite capacity

- Resources are rarely taken into account when scheduling, so:
  - The same resource can have tasks scheduled at the same time (no leveling)
  - The "critical path" (the traditional approach) ignores resource constraints
- With Critical Chain, the resources overload is resolved thanks to leveling



*Taking into account the capacities of resources is another key point of CCPM*

# Critical Chain planning is a 5-step process

- The method follows 5 steps

- 1) Removal of individual margins at a task level

© Marris Consulting *To avoid student syndrome, etc.*

- 2) Resource leveling

*To take into account resource capacity and limit multitasking*

- 3) Identification of the Critical Chain

*To determine what determines the duration of the project*

- 4) Start as late as possible

*To use project resources wisely*

- 5) Insertion of buffers

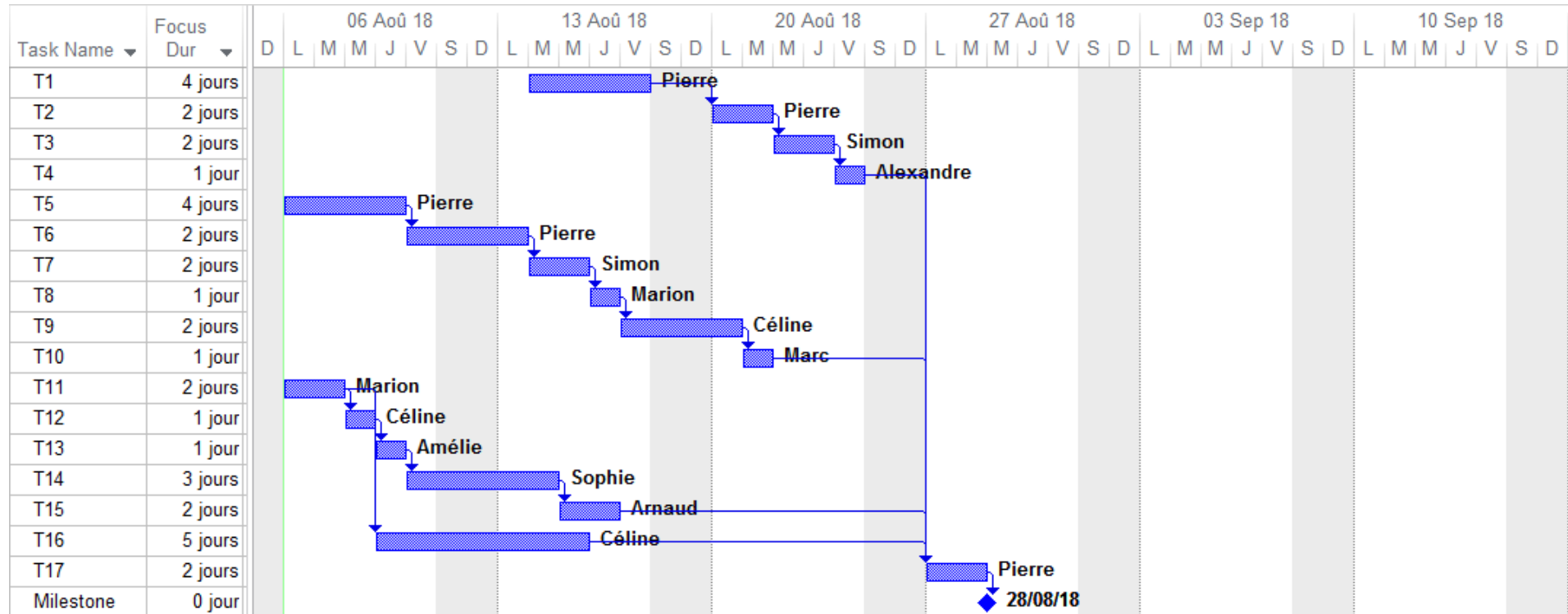
*To protect the project from problems and uncertainties*

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## From a traditional schedule to a CCPM schedule (#1/3)

- Individual safety margins at a task level are removed
  - The remaining “focused” durations are the working time required on **average** to complete the activity, without added safety margins and in **perfect working conditions**
- Leveling involves shifting the start of tasks based on resource availability.

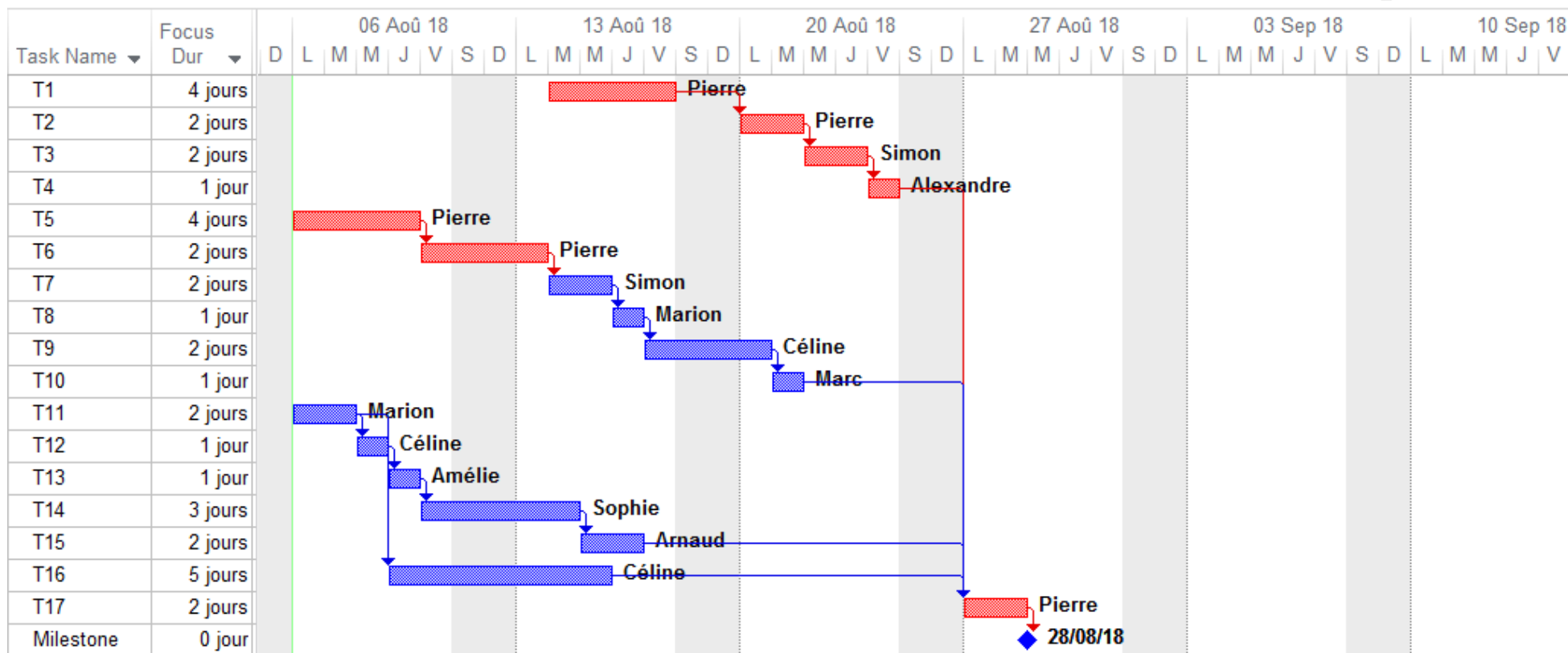




## From a traditional schedule to a CCPM schedule (#2/3)

- **The Critical Chain is the longest path of a project, taking into account logical links and resource dependencies.**
- The duration of the project is determined by its constraint: the Critical Chain.

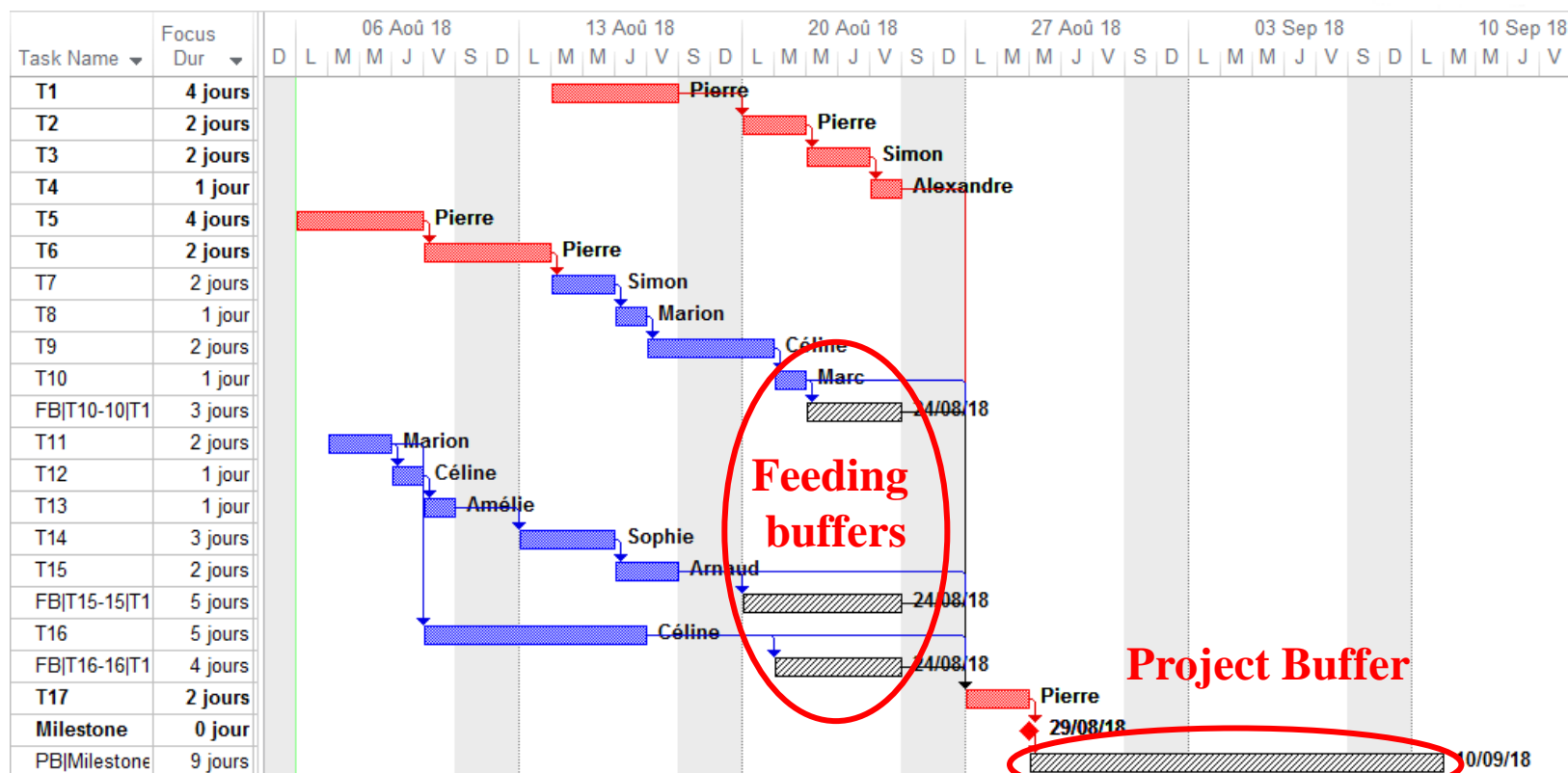
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## From a traditional schedule to a CCPM schedule (#3/3)

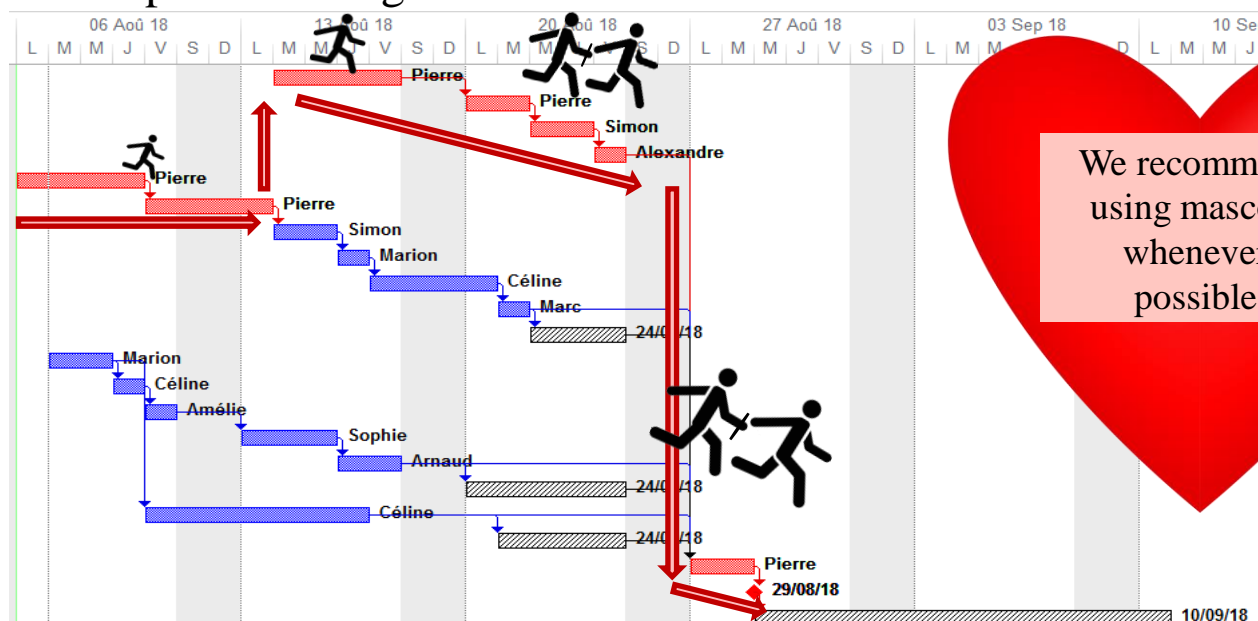
- The Critical Chain is protected from non-critical tasks by “feeding buffers”.
- The “project buffer” mutualizes the safety margins of the critical tasks to protect the project end date.

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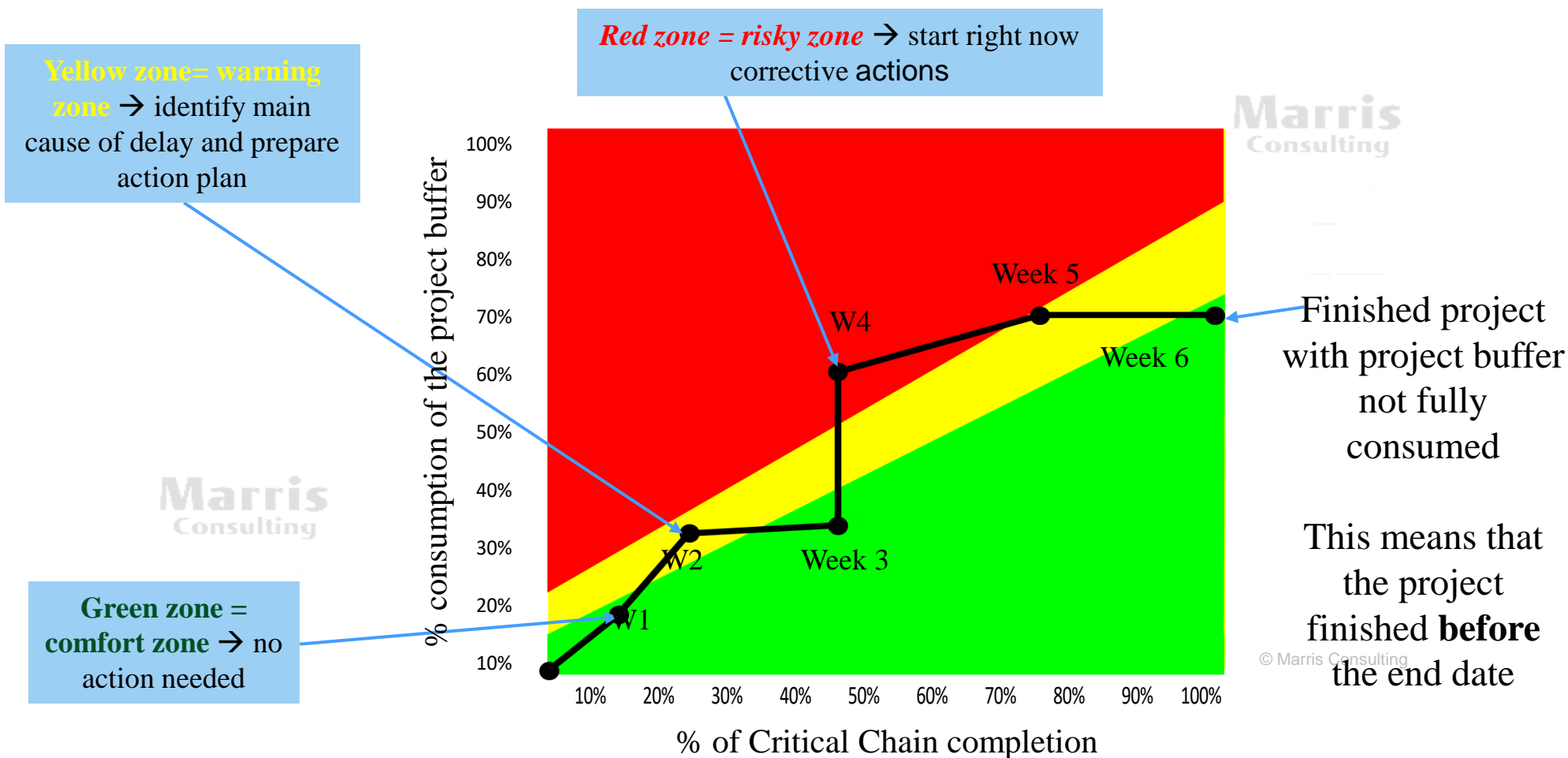
# Then during the project execution, we focus on the smooth execution of tasks on the Critical Chain

- The project is carried out like a relay race throughout the Critical Chain.
- Having a mascot (a noticeable object) enables one to follow physically the successive offices and workstations the Critical Chain passes through.



*By asking less than 1% of the resources to run,  
it's in fact the whole company that goes faster*

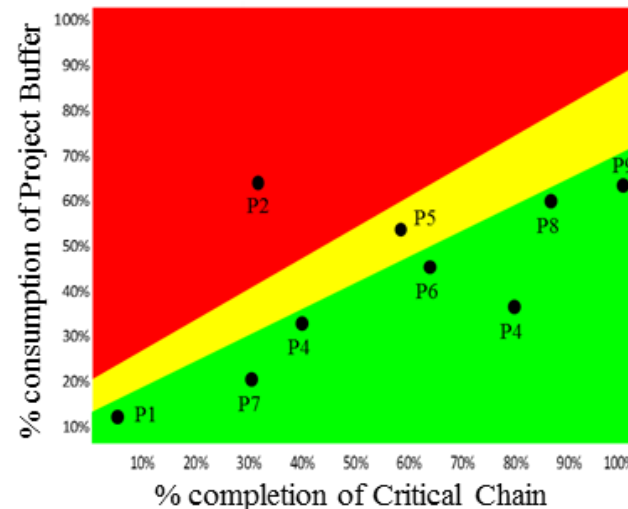
# Project monitoring is much easier thanks to the Project Fever Chart





# Managing a projects portfolio the Critical Chain way is easy

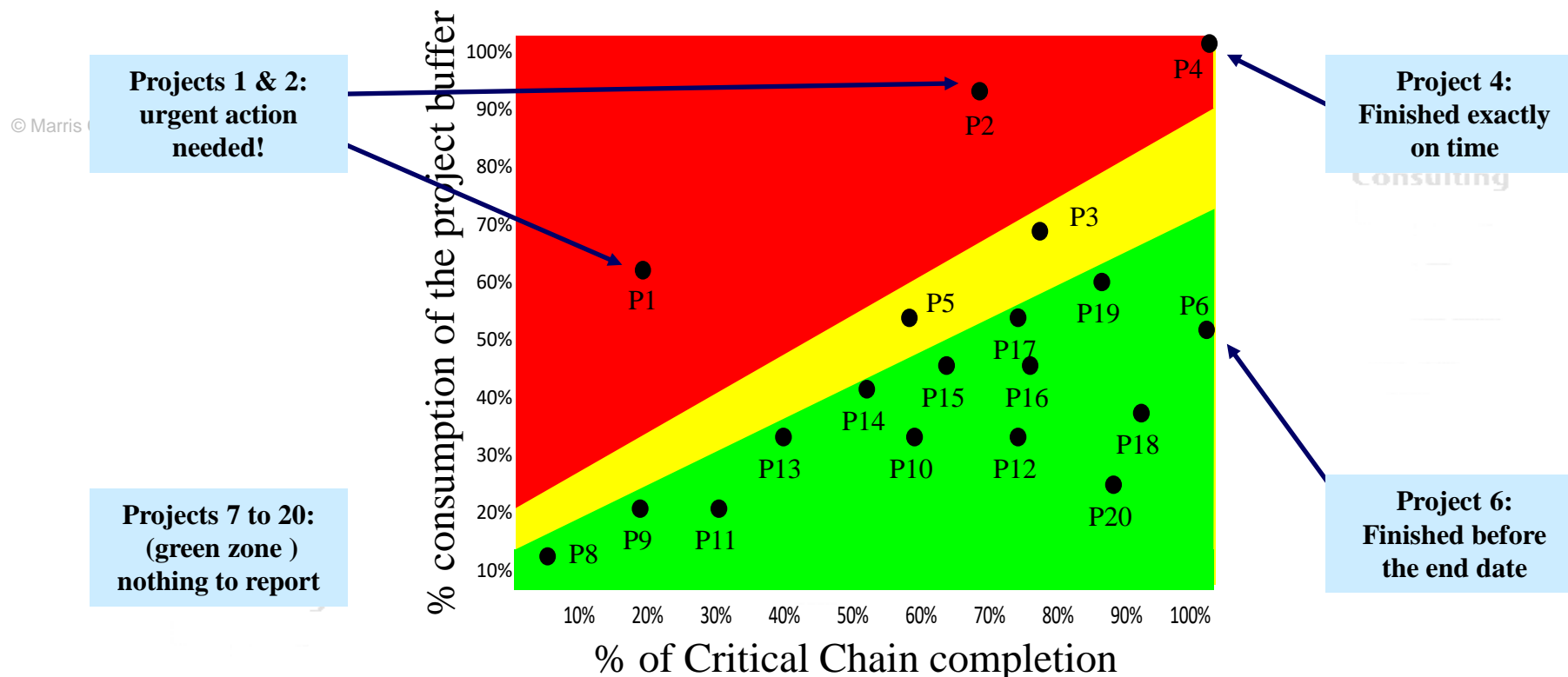
- If each project in the portfolio is well planned taking into account the uncertainties, available resources and practicing the “relay race” on the critical chain - if each project has a good chance of finishing on time - then managing a portfolio of healthy projects is relatively easy!
- It is sufficient to have a good system for identifying the priorities allowing all the actors to know what they must do at any time by referring to a shared and objective priority system.



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# The Portfolio Fever Chart

greatly facilitates dynamic arbitration between projects



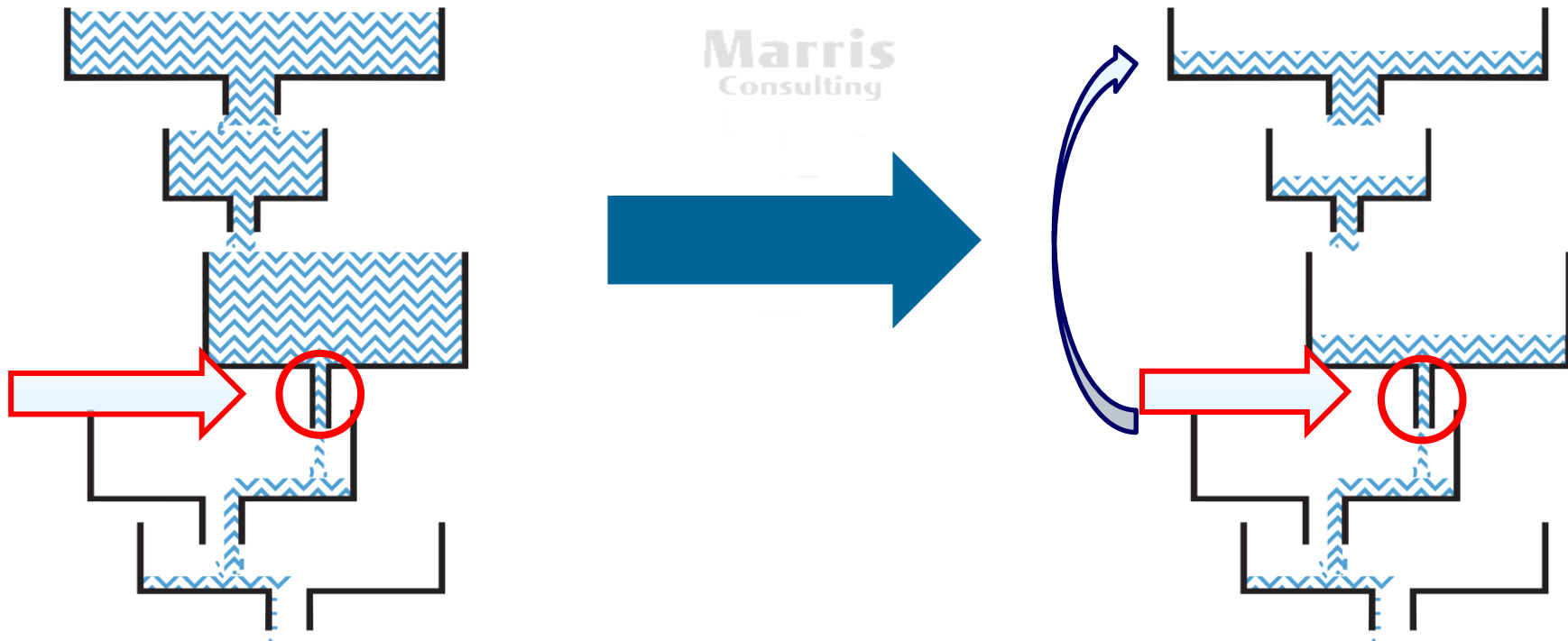
*The Portfolio Fever Chart helps to quickly manage all the projects in the portfolio with objectivity and transparency*

# To limit the number of ongoing projects, do not launch projects too early!

- Traditionally, people try to level resources between all projects
- With the Critical Chain approach, we only consider the capacity constraint of the portfolio
- Projects are launched according to the constraint's availability
- Thus we avoid unnecessary WIP that generates bad multitasking

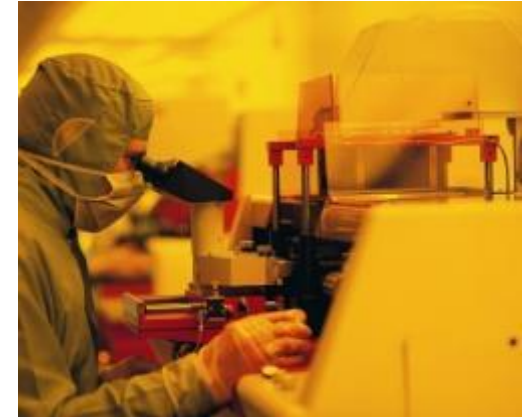
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# Critical Chain can improve any type of project

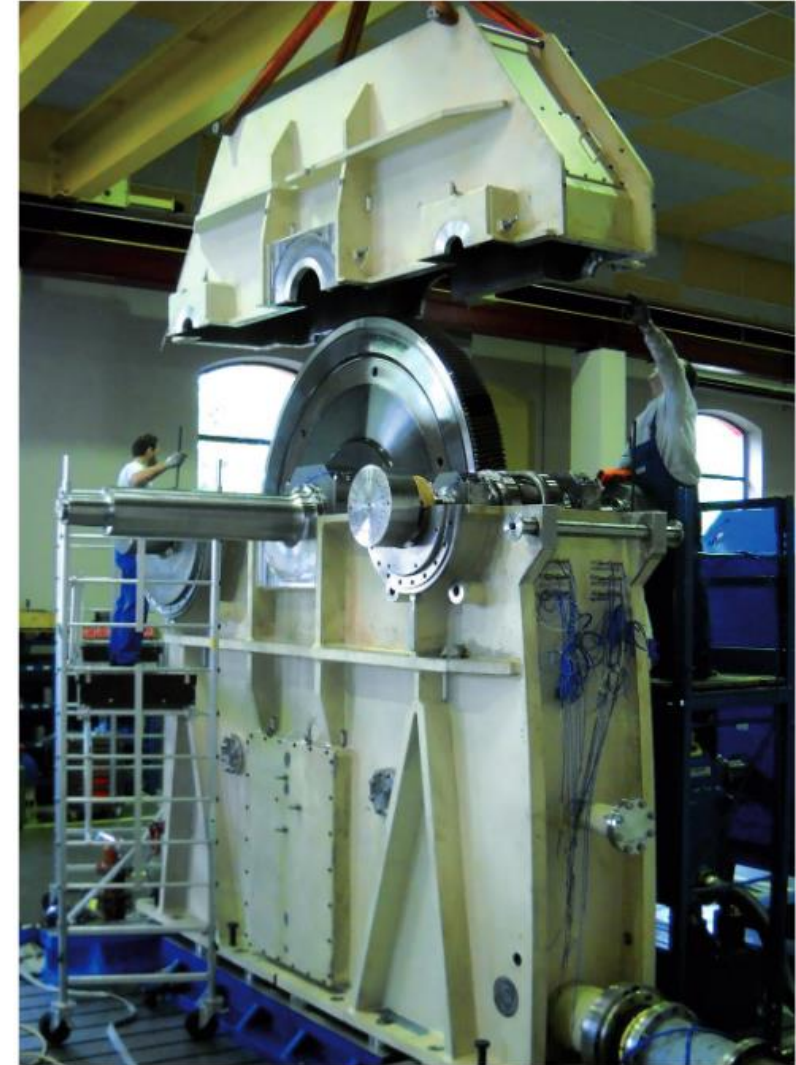
- New product or service development (project or portfolio)
- Non-repetitive Engineering To Order (ETO) and Make To Order (MTO)
- Construction projects, public works and large engineering projects
- Maintenance, Repair and Overhaul (MRO)
- Software development  
(often associated with an "Agile" approach like Scrum )
- ERP implementations
- Etc.





# Example of an ETO & MTO in the Oil & Gas industry

- Company of 500 people, part of a large group (> 300,000 people).
- Engineering to order (ETO) and manufacturing to order (MTO) company.
- It designs and manufactures large special gearboxes. Example: between a gas turbine and a generator in a power station.
- The bottleneck was in the Design Office (15 people) of the engineering department.
- It was overwhelmed: 90 projects in progress, 50 weeks to complete plans, documentation, certificates, etc.
- Initially, 1.8 designs completed per week.



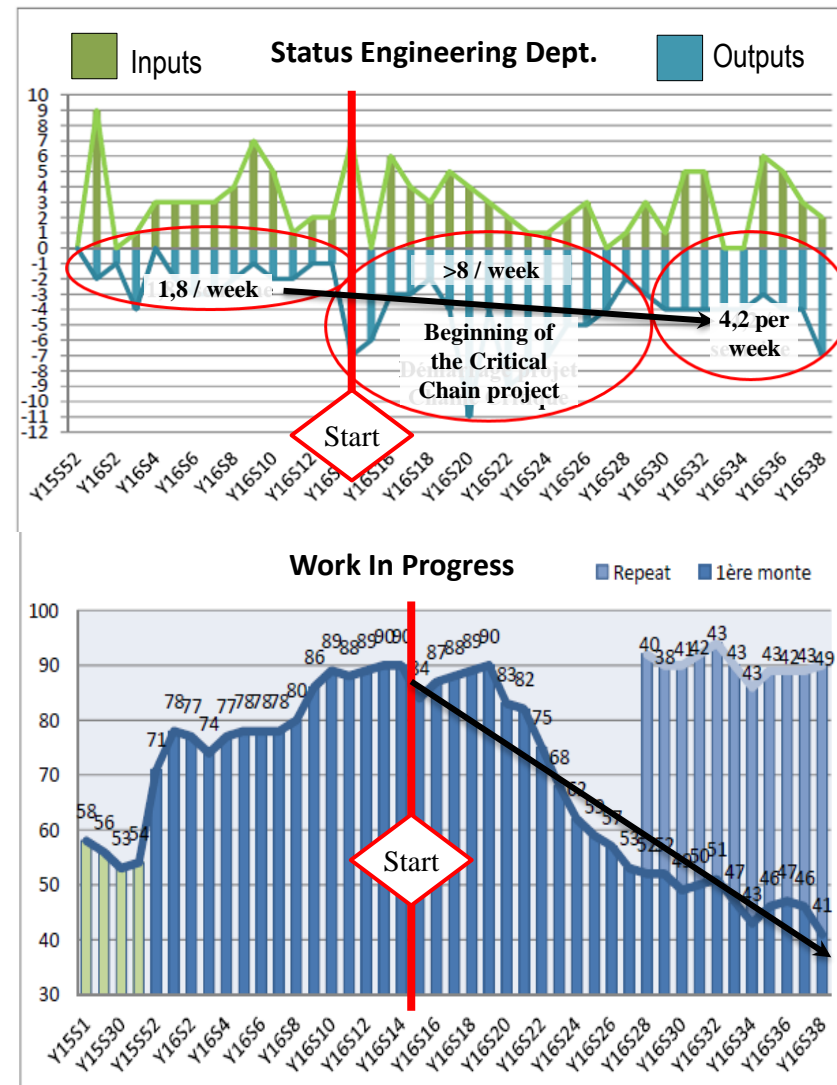
# The performance of the company suffered from excessive multitasking

- Initially, the working conditions at the Design Office (DO) were very bad (normal !?):
  - Up to 10 projects to be managed simultaneously by people,
  - Repeated disturbances,
  - Daily changes of priorities,
  - Management by "decibel".
- A DILO (Day In the Life Of) analysis revealed a **massive multitasking**. Change of tasks >60 times per day, i.e. an average of 7 minutes per task.
- This reduced productivity by 70-90%.
- This generated a lot of "stupid" quality issues (e.g. lots of BOM errors).

**BEWARE: multitasking kills**

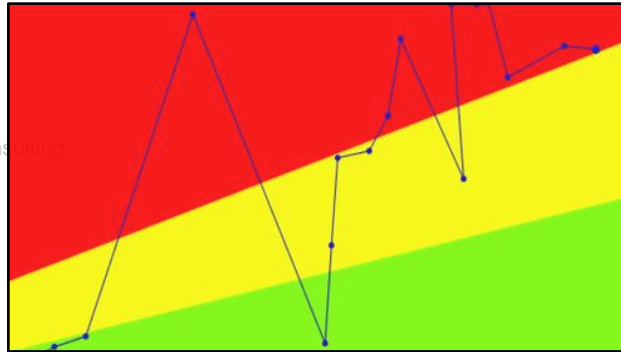
## A drastic reduction in WIP increased the productivity by 130%

- New rules put in place, with a key principle: “Stop Starting, Start Finishing! ”.
- Other rules:
  - Technicians should no longer be disturbed by other services,
  - The requests for modifications are filtered by two coordinators,
  - A project is not started until all data is available ("Full Kitting").
- The projects are prioritized in agreement with the sales department (only one priority list!) and staggered according to the bottleneck availability
- Throughput and productivity increased by 130% ...
- ... And >400% during the period of drastic reduction in work in progress
- Lead times in the DO were reduced from 50 to 8 weeks

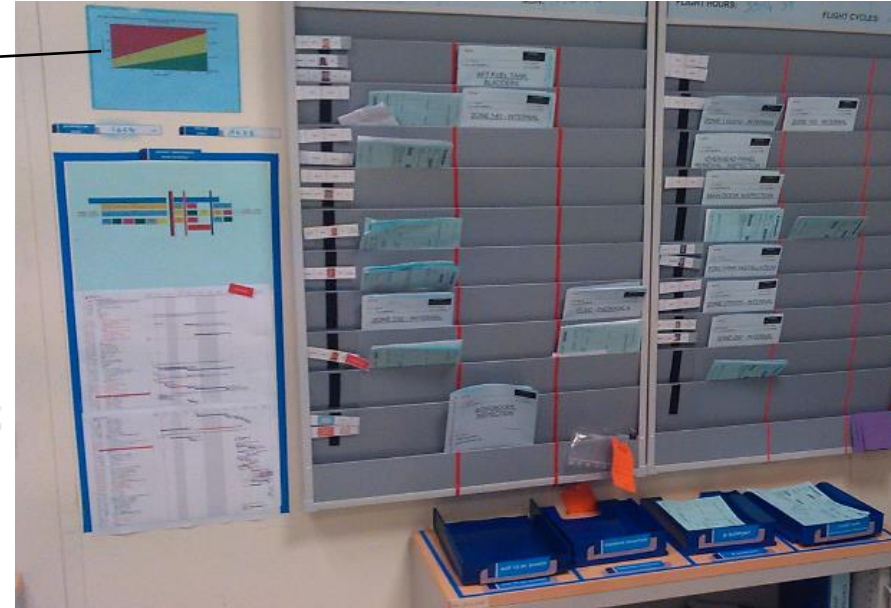


# MRO – Maintenance Centre for Executive Jets

## Aircraft Turn Around Time reduction at Embraer Le Bourget



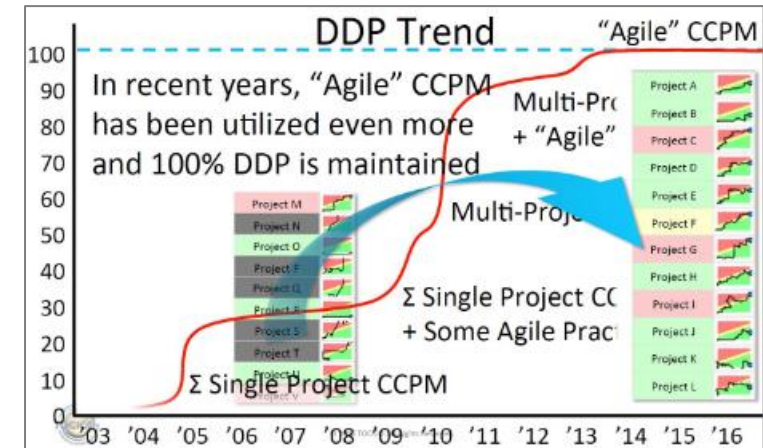
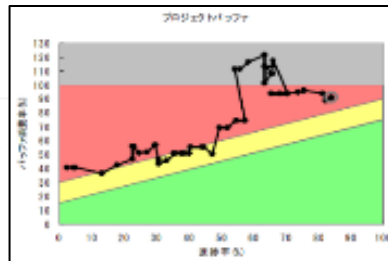
- Deployment of Critical Chain for dynamic scheduling of the work of mechanics.
- Initial pilot: "C-Check" maintenance or "96-month check".
- Reduction in aircraft downtime duration of over 50 % (from >10 to 5 weeks). Current target is to further reduce to 3,5 weeks.
- Increase of labour productivity by more than 70%.
- Reduction in the level of stress. Stability and clarity of the priorities set by management. Reduction in multitasking.
- Implementation of "pipelining" of aircraft. Development of a hangar portfolio Fever Chart.





# Mazda, car manufacturer, after a 10 year roll out the first complete cars "Made by ToC" are now available

- Initially used to develop a new engine family, SKYACTIV.
- Project duration was divided by 2 and cars using that engine (CX5, Mazda 6, ...) won 73 rewards around the world in 2012 and 2013.
- Notable increase of New Product Development capacity & increase in productivity.
- CCPM then rolled-out to all the company's development projects.
- Note: This is not a Marris Consulting reference.





# Agenda

- Introduction
- Presentation of the Theory of Constraints  
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- The Theory Of Constraints in production
- The Theory Of Constraints in projects
- Conclusion

- Annexes

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# How can you apply the Theory of Constraints if you don't know where your constraint is?

- Unfortunately, initially, companies often make mistake when identifying their constraints.
- © Marris Consulting A few tips to identify your constraints:
  - Watch the flow (Gemba / field visits):
    - Find the longest line/ where the projects are blocked
    - Check the sources of ruptures,...
  - Do not blindly believe the data that comes from your computer system
  - Be careful if the bottleneck is too good to be true
  - When you have a hypothesis for the location of a bottleneck, TEST IT!



## By the way there are always two simultaneous constraints

- The goal of a company is to make more money **now** and in the **future**.
- So there are always 2 simultaneous constraints:
  - The **constraint** that controls how much money you can make **now** (by executing the order book)
  - The **constraint** that controls how much money you will make in the **future** (product development etc.)



# Identifying the constraint is the first step to a continuous improvement process...ultimately you should choose it

- "Orthodox" Theory Of Constraints is based on an iterative 5-step process
- We believe that "2<sup>nd</sup> level" TOC is to choose the "best" constraint and organize the non-constraints around it.
- Philip Marris' definition of the "best" constraint: the resource that would take the most money and/or time to turn into a non-constraint.

Presentation of the Theory of Constraints

The 5 steps of ToC's continuous improvement process

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

Easy to do in production but not in projects

Without investments in \$ or in time

The most difficult step

With investments in \$ or in time

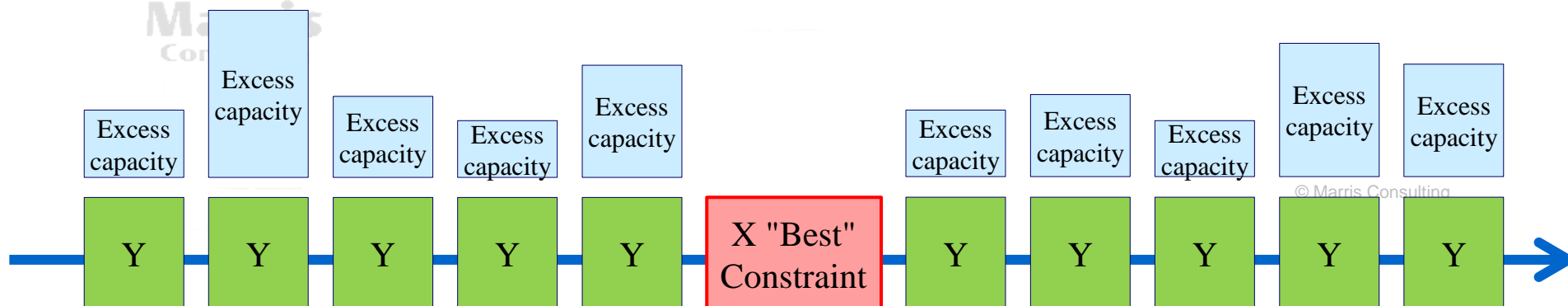
Or choose the "best" constraint of the system

Note: Often called *The 5 Focusing Steps* or *ToC's Process Of On-Going Improvement (POOGI)*.

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Webinar How to find bottleneck EN V1.0 20200527

How to find bottleneck in production and projects  
- Webinar, 27<sup>th</sup> of May 2020 -

8



# Thank you for your time...coming soon...

- Several other webinars like this one on various subjects of operational performance
- Videos with Chinese subtitles on Chinese domestic media
- Many articles and points of view

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*SupplyWe and Marris Consulting partnership will be publishing a lot of freely available content in the coming weeks and months.*

# Stay tuned!

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Thank you for your time

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# Questions ?

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Do not hesitate to connect with me on LinkedIn

[linkedin.com/in/philipmarris](https://www.linkedin.com/in/philipmarris)

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# TOC Community in China with SupplyWe 共创研究院

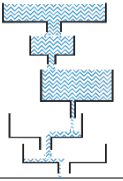
- SupplyWe / Co-Creation Research Institute is a consulting organization established by Co-Creation IoT Technology to help companies achieve continuous improvement and greatly improve overall performance.  
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- They organically combine TOC, Lean and other management methods, and apply solutions in project management, manufacturing and supply chain fields;
- Based on research and insights into new business in the future, Co-Creation Research Institute systematically integrates advanced management concepts and algorithms to help customers achieve the strategic goals of smart manufacturing and Industry 4.0.
- TOC Café is an online + offline open community initiated by SupplyWe
- TOC Café believes that by organically combining advanced management theories (TOC, Lean, Six Sigma, etc.) and practical applications, great results can be obtained quickly.
- TOC Café hopes that more like-minded partners can stand on the shoulders of giants, exchange ideas, discuss exchanges, and use theory of knowledge as the basis of management to achieve personal growth and contribute to the service enterprises, and solve them quickly and effectively.



WeChat public account: 共创研究院



Join TOC Café (TOC咖啡馆)



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## ■ Annexes

Our website:  
*www.marris-consulting.com*



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## Training Theory of Constraints & Lean in production

### Using ToC to boost your Lean programme

Next online sessions:

From 6<sup>th</sup> to 9<sup>th</sup> of April 2021 (Fr)

From 27<sup>th</sup> to 30<sup>th</sup> of April 2021 (En)

[Details and registration](#)

[Home](#)

**Welcome to the Marris Consulting website, a company focused on improving significantly and sustainably the performance of manufacturing and process industries**

We have over 25 years of experience of combining the Theory of Constraints (ToC) with Lean to go faster and further:  $1 + 1 = 3$


### Project focus

#### Our 2-day diagnosis offer



You want to identify the constraint that limits your performance, but you need some help to do so? Marris Consulting offers a 2-day diagnosis led by Philip Marris and his

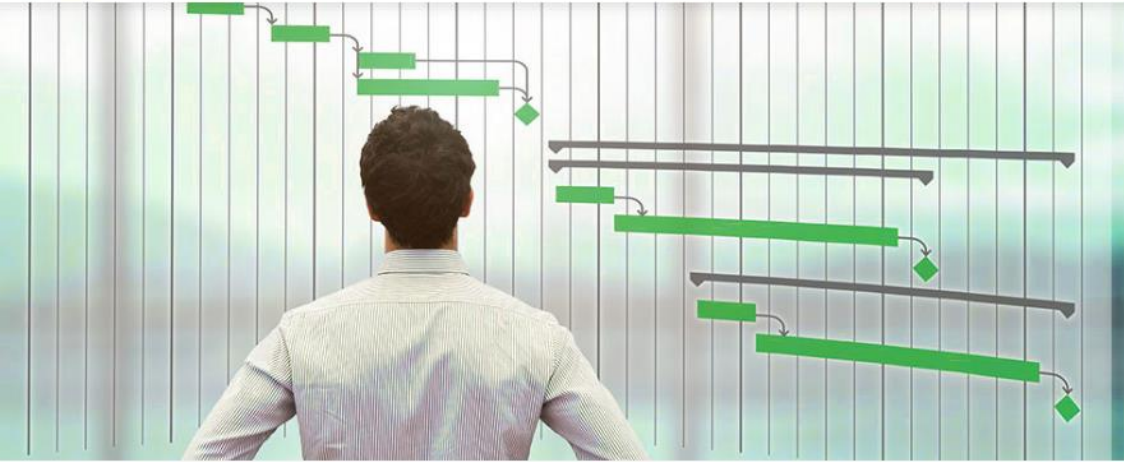


A dedicated Critical Chain website:  
*www.critical-chain-projects.com*



[Home](#)[The Method](#)[Our point of view](#)[To go further](#)[Videos](#)[Training](#)[Diagnosis](#)[Contact Us](#)

[FR | EN](#)



# Critical Chain

an innovative method of project management

[THE METHOD →](#)

## Dare to finish all your projects on time!

This approach, a part of the Theory of Constraints (TOC), answers 2 recurring questions:

1

How to finish your projects on time, within budget commitment and honour the initial specifications?

2

How to accelerate your projects (of new products development, of non-repetitive productions, of software development, of construction, ...)?



# Useful web links

## To get the latest news about Theory of Constraints

- 5 permanent news website dedicated to Theory of Constraints (www.Scoopit.com)

- Theory of Constraints (French & English)
- Critical Chain (French & English)
- TLS: ToC + Lean + Six Sigma (English)

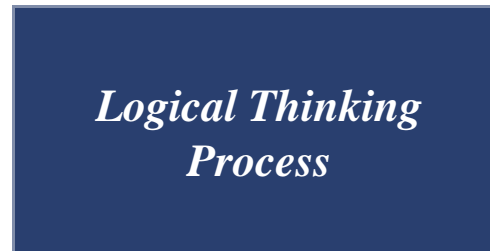
- >300 Videos (Marris Consulting YouTube Channel)

- Discussion groups (LinkedIn)
  - Critical Chain Project Management
  - Theory of Constraints
  - TLS: ToC, Lean and Six Sigma
  - Logical Thinking Process

- Others:
  - Twitter, Facebook, etc...

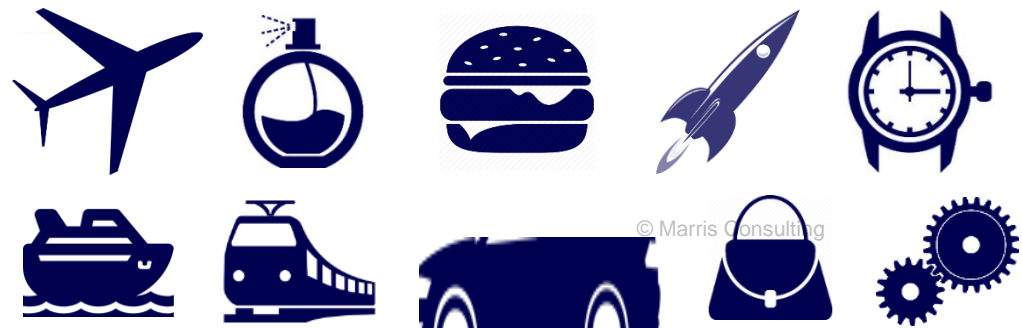


# Marris Consulting organizes more than 30 inter and intra-company training session per year



# Presentation of Marris Consulting

- Marris Consulting, founded in 2005, is a consulting company specializing in improving the operational performance of companies in the industrial world.
- The approach of Marris Consulting is based on the combination of Theory of Constraints (ToC), - and its various applications including Project Management by the Critical Chain -, and Lean and other Six Sigma type methodologies when it helps our customers' issues.
- Marris Consulting has a reputation for its ability to be pertinent in all kinds of industry. We have worked in over 250 companies helping in designing, making, selling and distributing:
  - cars, hamburgers, airplanes, perfume, trains, rockets, industrial equipment, pharmaceuticals, home delivery services, computer chips, chips (food), maintenance / repair / overhaul (MRO) of planes and trains, luxury handbags, corrugated cardboard production, the defense industry, Swiss watches, steel manufacturing, plastics, bank notes, satellites, gold mines
- We are committed, viscerally, to producing results.  
Results that are well beyond our clients' expectations.  
And results that last.  
Better still, we incessantly seek to strengthen the process of on-going improvement; we want to see our ex-clients getting better and better many years after we intervened.
- Marris Consulting is based in Paris,  
but operates throughout France, Europe and around the world





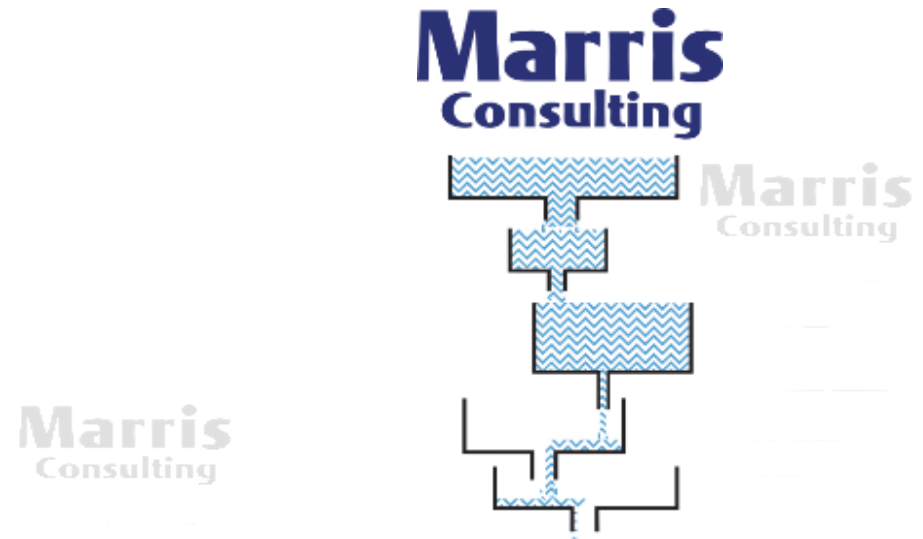
## How we do it

- We understand that the hardest part of what we do is to change "people". In addition to the pertinent ideas we must have, we must directly and indirectly change individual and collective behavior.
- We work simultaneously at all levels of the company from the front line to the board room.
- We are recognized experts in many different fields: "Lean" (manufacturing/engineering/management/...), the Theory of Constraints, Six Sigma, Industry 4.0, DDMRP ...
- One of our key strengths is that we analyze each of our new client's business & culture and then, we mix up the right cocktail of solutions. We never impose a so-called industry best practice.
- We like simple solutions. Simple is beautiful.



Philip Marris presents the  
38<sup>th</sup> TOCPA Conference program

# Marris Consulting



*Factories, People & Results*

Tour Maine Montparnasse  
27<sup>th</sup> floor  
33, avenue du Maine  
Paris 75755 Cedex 15  
France  
Tel. +33 (0) 1 71 19 90 40  
[www.marris-consulting.com](http://www.marris-consulting.com)

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