

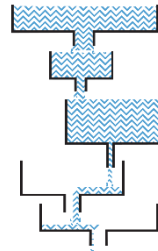
Critical Chain Project Management

Will you dare to finish all your projects on time?

- *Training material* -

Extract

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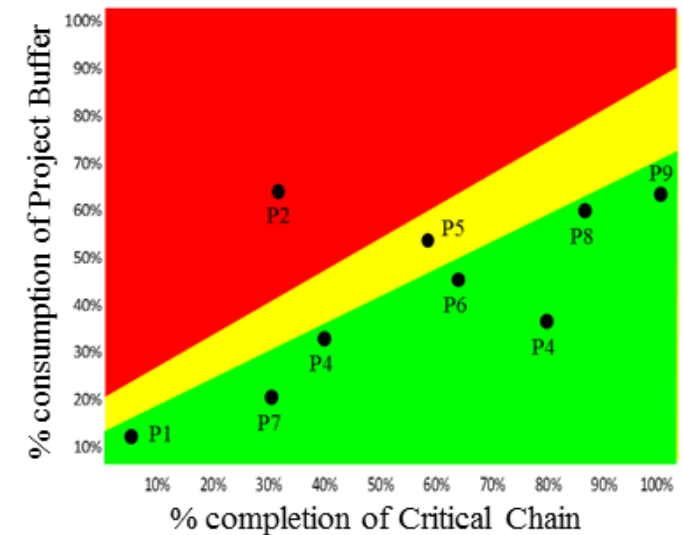


Paris, 23th of May 2019

Version 1.0

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Extract

Training facilitator: Philip Marris,
CEO of Marris Consulting, ToC & Lean expert, >30 years, >200 projects

- Consultant (warning!).
- Theory of Constraints specialist. 32 years of ToC experience. Started working with the founder Eliyahu Goldratt in 1986. 34 year experience of Lean (Manuf. & Engineering)
- >30 years of experience helping over 200 companies in all industries.
- Over 50 assignments in project environments especially New Product Development & MRO (Maintenance Repair & Overhaul).
- Author of the very boring but bestselling French textbook about ToC in manufacturing *Le Management Par les Contraintes*.
- Author of numerous articles. Over 10 conferences a year worldwide on these subjects.
- Administrator of several LinkedIn discussion groups. Creator of the French website chaine-critique.com and curator of several Critical Chain, ToC, "ToC + Lean + Six Sigma" news websites.
- Founder and CEO of Marris Consulting based in Paris, France. Founded in 2004.
Motto: *Factories, People & Results*.



Training goals

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- Understand the limits and consequences of traditional project management methods
- Learn how to plan and execute projects the "*Critical Chain way*"
- Get an overview on how to implement Critical Chain

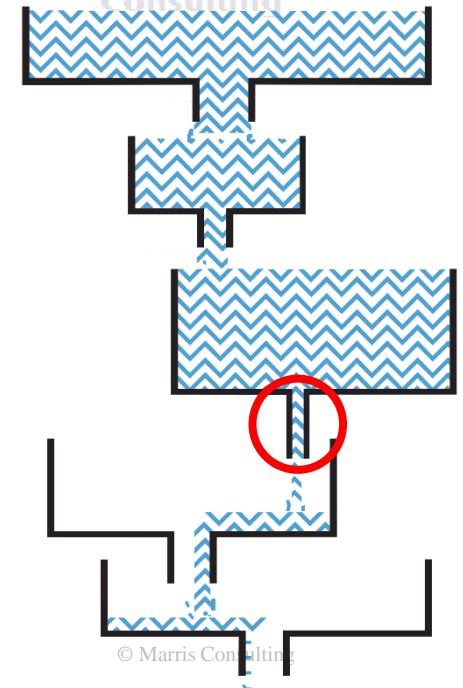


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Focus on improving the system constraints that determines the overall performance

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

- Companies (factories, engineering departments ...) and other organizations inevitably have unbalanced capacities.
- 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 constraint's 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

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The 5 steps of ToC's continuous improvement process

1. IDENTIFY the system's constraint(s).

Easy to do in production
but not in projects

2. Decide how to EXPLOIT the system's constraint

Without investments
in \$ or in time

3. SUBORDINATE everything else to the above decision.

The most
difficult step

4. ELEVATE the system's 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's constraint.

Or choose the "best"
constraint of the system

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

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Gartner recently recommended Critical Chain Project Management

"Anyone who is working on projects and is concerned about on-time delivery should care about CCPM."

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Therefore, those who should care include CIO's, PMO leaders, portfolio managers, program managers and project managers."

Source: April 2016:

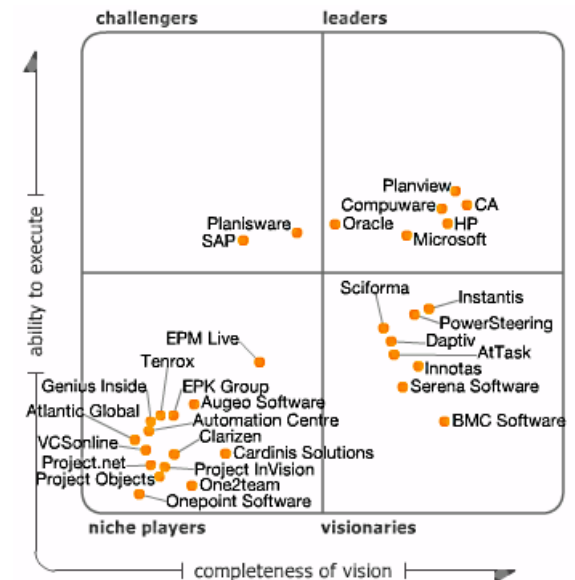
<http://www.gartner.com/document/3281117>

&

<http://www.businesswire.com/news/home/20160419005528/en/Exepron-Named-Cool-Vendor-Gartner>



Magic Quadrant for Project and Portfolio Management



Source: Gartner June 2010

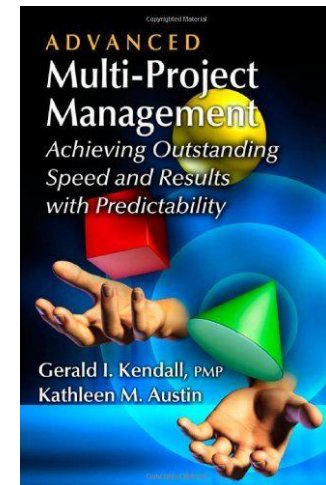
Extract

Over the past 15 years, Critical Chain has demonstrated its ability to greatly improve the performance of project planning and execution

- Critical Chain Project Management (CCPM) enables organizations to finish their projects on time, without budget overruns nor loss of initial specifications.
- Furthermore CCPM can, simultaneously, significantly reduce project durations and increase the efficiency (productivity) of the resources involved.

Results	Average	Worst case	Best case
Project durations	- 39%	- 13%	- 78 %
Number of projects completed in a given time	+ 70 %	+ 15%	+ 222%
Throughput	+ 53%	+ 14%	+ 150%

*See appendix for a list of cases.
A more complete list
is available at
www.chaine-critique.com*



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.

Extract

Traditional Project Management is widely used...and doesn't work well

- Project success, in terms of delay and cost, is strongly correlated to the company maturity in project management.
- A 2012 PMI (Project Management Institute) study estimates that at least 30% of projects are not achieved on time in companies with a high degree of Organizational Project Management maturity, and more than 60% of projects are late in companies with a low maturity in project management.
- Causes of delays are diverse:
 - Resources are not available on time
 - Specifications change during the project
 - Technology is not mastered
 - ... etc.

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Reported
Organizational
Project Management
Maturity Level

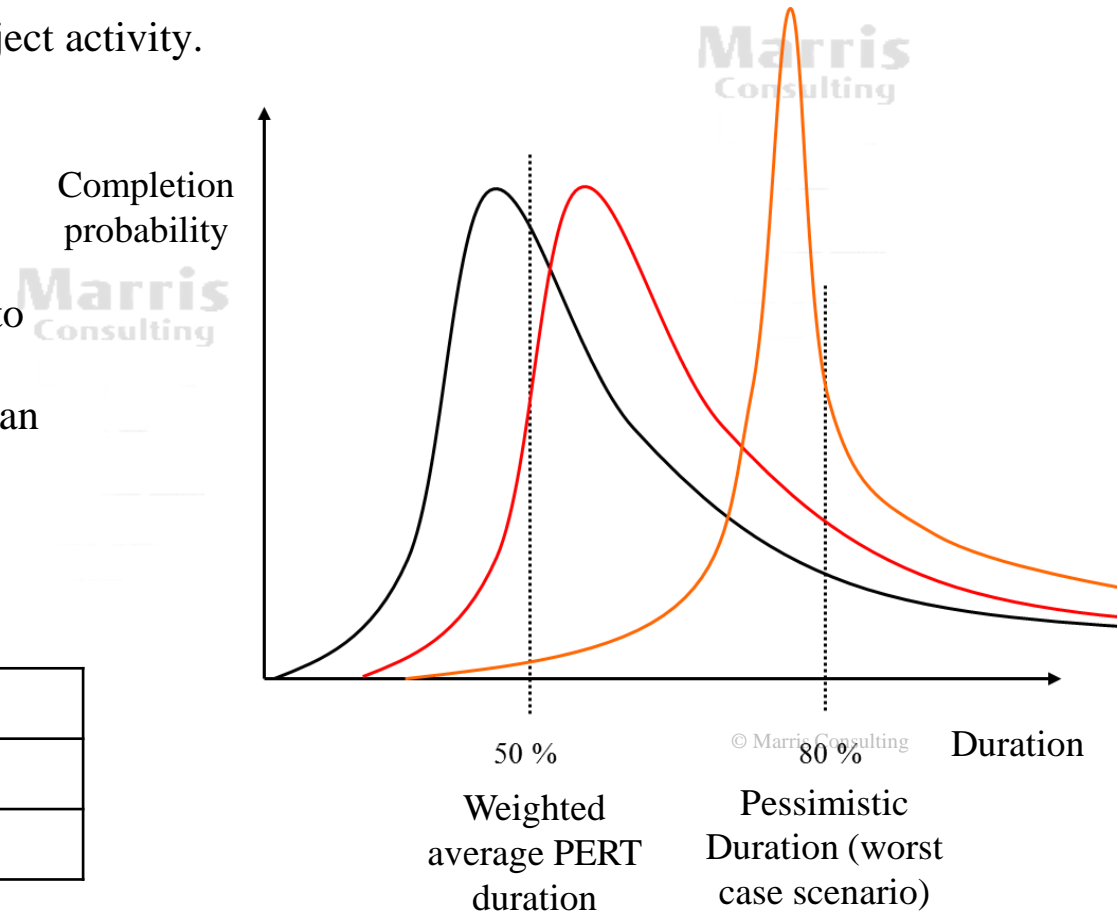
	% of on-time projects	% of on-budget projects	% of projects meeting original goals and business intent
High	67%	68%	73%
Medium	55%	58%	67%
Low	39%	44%	53%

Scheduling projects according to the worst case scenario leads to numerous disruptive behaviours

Extract

- The duration based on the worst case scenario or pessimistic durations, adopted by project managers, is often twice as long as the PERT duration.
- Thus there are huge margins built into each project activity.
- The existence of these margins results in particular behaviours:
 - Student syndrome: A difficult task or a lowly motivating task is often postponed to the very last moment, the same way a student waits until the last minute to start an assignment,
 - Parkinson's law: the work spreads out in order to occupy the whole available time.

	PERT Weighted average
	Student syndrome
	Parkinson's law



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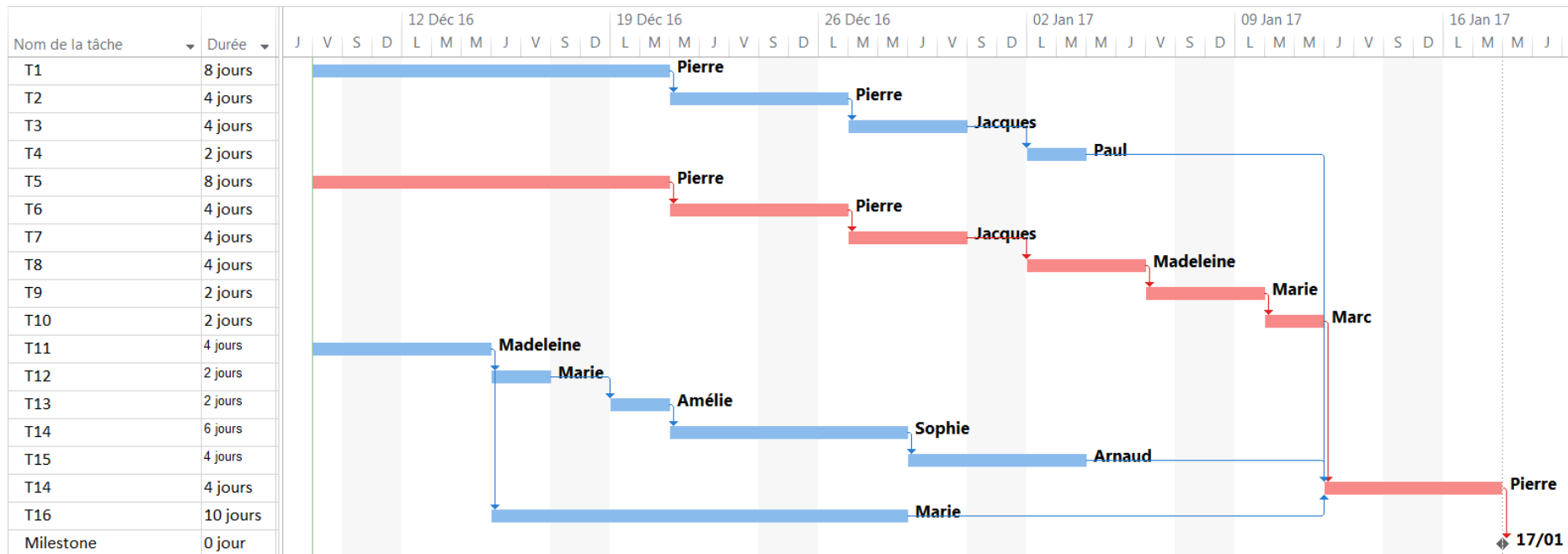
A dynamic schedule must include resources

- Resources are seldom taken into account in schedules, consequently:
 - A resource can be assigned to several tasks at the same time (no levelling),

© Marris Consulting The critical path neglects resource constraints

- Non-critical tasks are planned to start as soon as possible.

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- Or, bottom up after having trained those that estimate the durations in the Critical Chain way of doing task duration estimates: "the focused duration" (no multi-tasking) and with 50% probability of exceeding the estimate.

- This way, we prevent the waste of local and individual margins.



Critical Chain scheduling

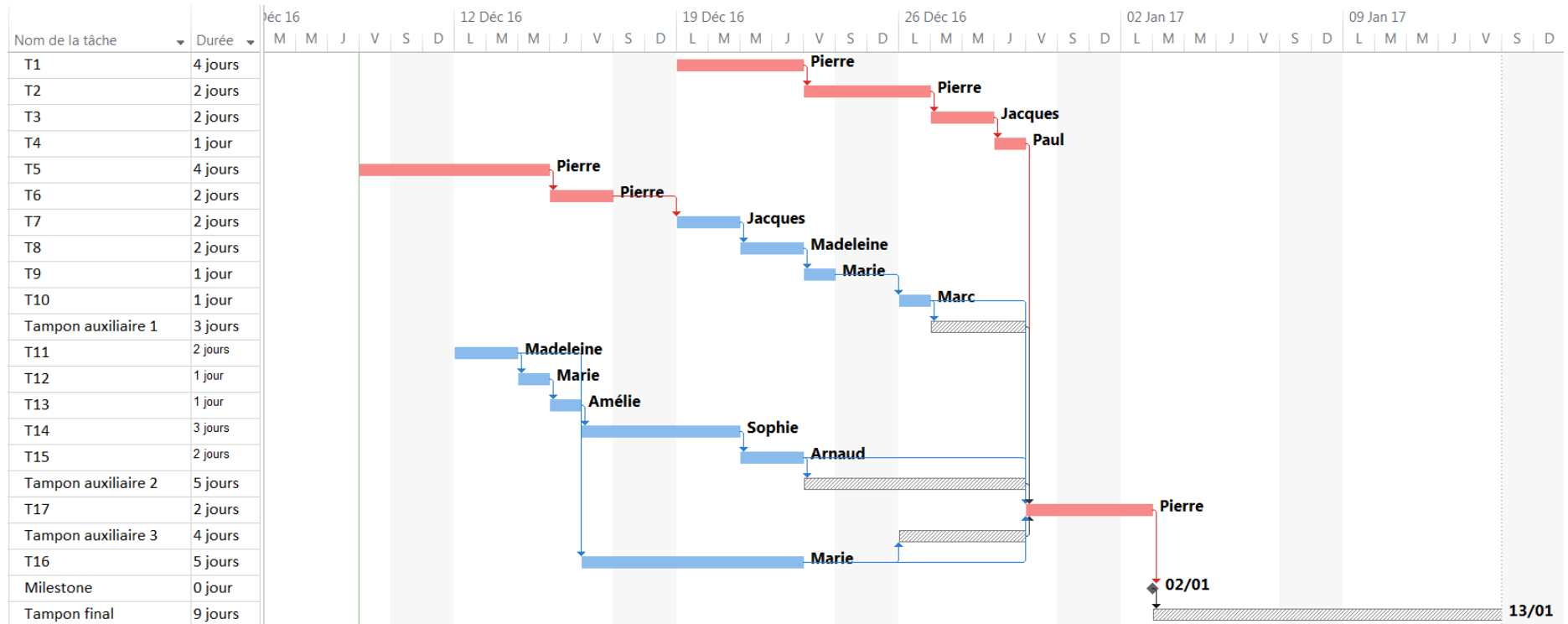
Step 5: Buffers calculation and integration

Extract

- The project buffer mutualizes safety margins of critical tasks.
- It represents about one third of the total project length.
- Feeding buffers protect the Critical Chain from non-critical chains/ tasks.
- Non-critical tasks are scheduled « Just-in-Time » thanks to the feeding buffers.

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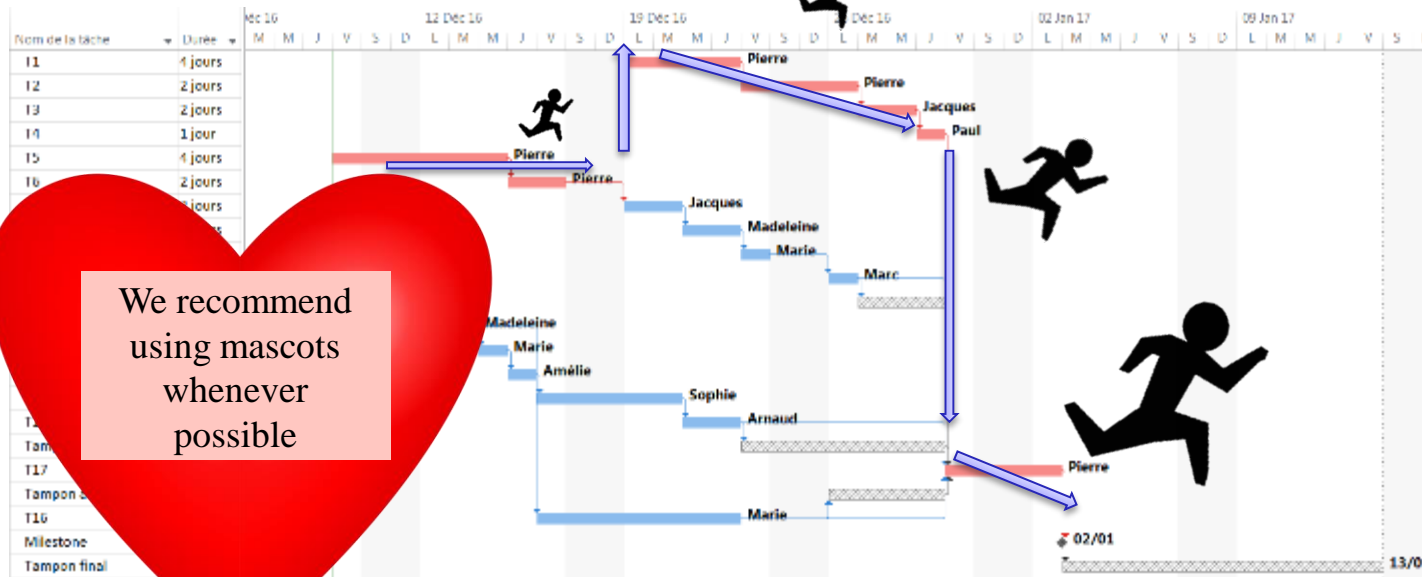
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Then during the project execution, we focus on the smooth execution of tasks on the Critical Chain

- The project is carried out according to the principle of the 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

 Extract

Project staggering helps reducing bad multitasking

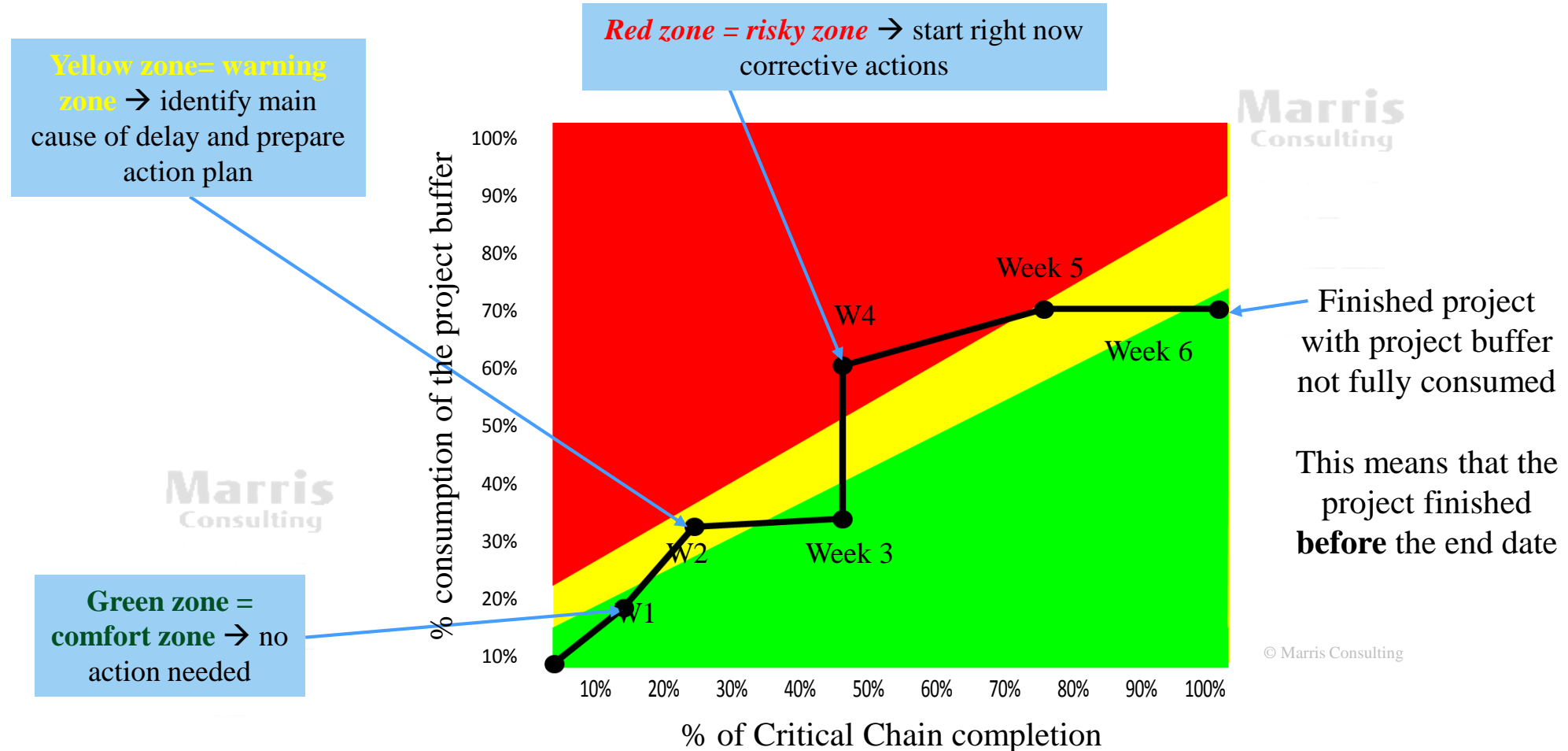
- Levelling all the resources of a portfolio creates a large and complex domino situation
- Staggering means fixing the beginning of each project according to the availability of a pacing resource
- How to choose the pacing resource of a portfolio?
 - Where is the capacity constraint among the various resources used?
 - Where are the projects most likely to be stuck for the longest time?
 - Where are the projects most likely to cause bad multi-tasking?
 - Which is the department with the most important resources to exploit?
- Without dynamic arbitration of resource conflicts, staggering isn't a lasting solution to the multi-projects problem
- When implementing CCPM there will nearly always be a transition phase during which the number of projects simultaneously active will have to be significantly reduced. There are 3 different possibilities: freezing some projects; killing some projects; using the 2 for 1 rule (launch 1 project when you have finished 2)

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To finish your projects on time, start them later!

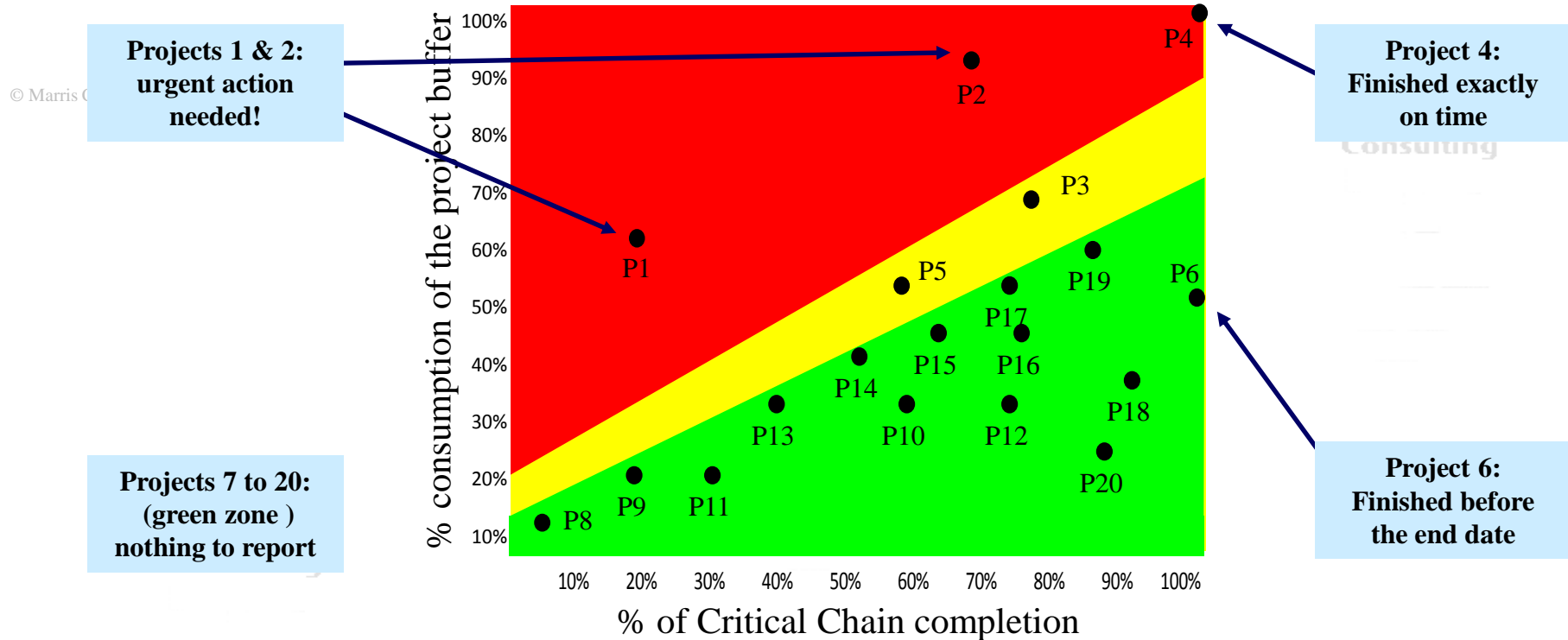
Extract

Project monitoring is much easier thanks to the Project Fever Chart



Extract

The Portfolio Fever Chart greatly facilitates dynamic arbitration between projects



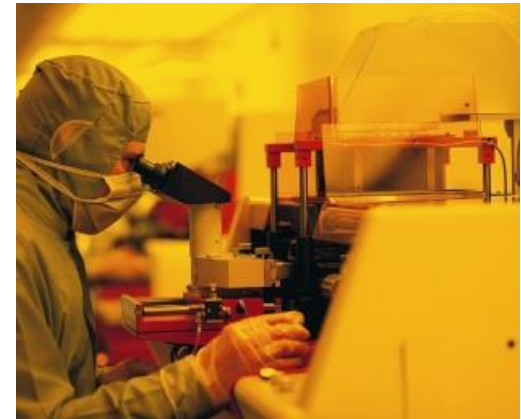
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The Portfolio Fever Chart helps to quickly track all the projects in the portfolio with objectivity and transparency

Extract

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)
- © Marris Consulting
- 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.



Extract

Over the past 15 years CCPM has been implemented thousands of times

- There are probably over 3,000 cases in the world today
 - Many of them in the USA where CCPM first got traction
 - but also in certain other countries: Japan, India, Israel, France, ...
- Over 500 cases documented (and about 300 others currently being validated)
 - See Gerald Kendall et Kathleen Austin: Advanced Multi-Project Management, J. Ross Publishing, 2013.
 - And the list that we are building up on our CCPM website (currently only in French): www.chaine-critique.com
- The best known cases:
 - Mazda, Boeing (Lean+), Procter & Gamble, NASA, ABB, U.S. Navy, Delta Airlines Maintenance.
- In the next few pages we will:
 - Present a list of 91 CCPM projects for which the results have been publicly documented.
We (Marris Consulting) regularly update a list of CCPM cases worldwide so it is recommended to check regularly as the list is completed.
 - Present in more detail a dozen cases most of which are Marris Consulting clients

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Partial list CCPM references in the world with publicly published results

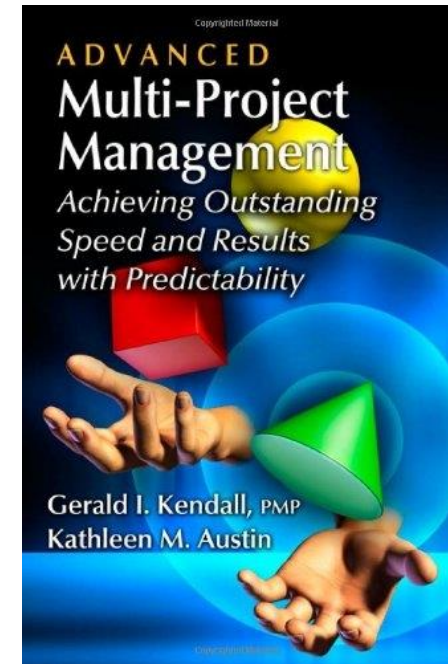
(See appendices for more references)

Extract

Industry	Project Type	Company	Results	Reference
Power	Engineering	ABB AG, Power Tech. Division	Throughput increase over 33% from 300 Bays to 430 Bays per year.	www.realization.com
Power	Engineering	ABB Cordoba	Engineering cycle time reduced from eight months to three months.	www.realization.com
Power	Repair	ABB Halle	Number of projects completed per year increased from 42 to 54, >25%.	www.realization.com
Construction	Theme park design, install, and commission	Action Park Multiforme Grupo	Increased number of projects completed from 121 to 153.	www.realization.com
Communications	Product development	Airgo Networks (Qualcomm)	Cycle time improved from 19 months to 8 months.	www.realization.com
Aluminum	Engineering	Alcan Alesa Technologies	Number of projects completed increased over 30%.	www.realization.com
Communications	Telecom switch design	Alcatel-Lucent	Increased throughput by 45% per person.	www.realization.com
Software	Software development	Alna Software	Cycle time reduced by 25% and project completions increased 17%.	www.realization.com
Automotive	Product development	Alpine Electronics	Delivery dates compliance rate went from 22% to 88%	www.japan-toc-association.org
Communications	Customized software development	Amdocs	14% increase in revenue/man-month; 20% reduced cycle time.	www.realization.com
Manufacturing	Boiler installation	Babcock	Actual versus planned went from +200% to -20%. Between 20% and 55% reduction of manhours. 40% reduction of cycle time	www.tocpractice.com

A list of >350 companies using Critical Chain

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 Bajio 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, 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.



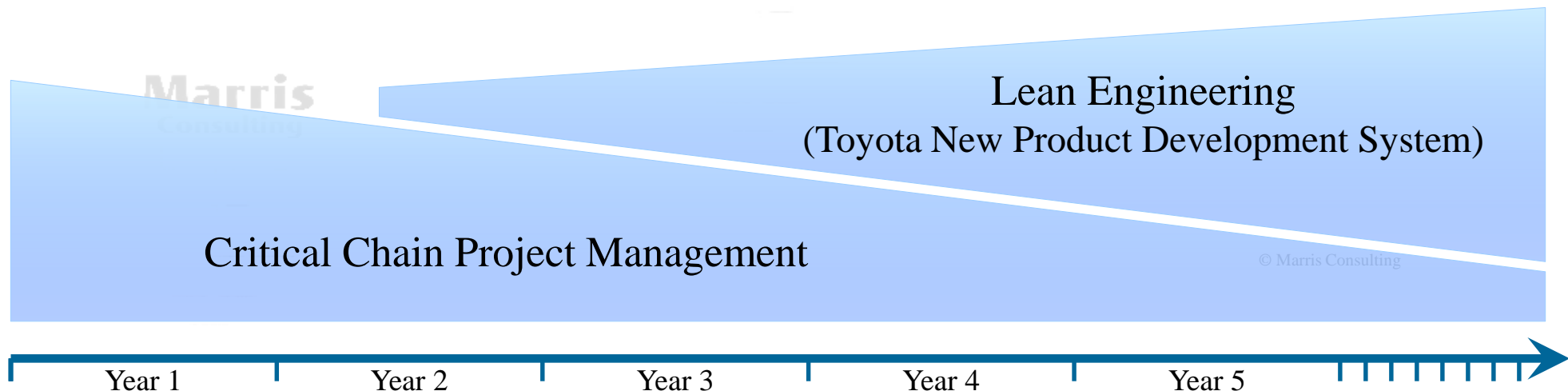
Source: "Advanced Multi-Project Management Achieving Outstanding Speed and Results with Predictability" 2013 book by Gerald I. Kendall & Kathleen M. Austin.

Appendix
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Extract

For New Product Development projects, CCPM is an ideal predecessor to Lean Engineering

- Today the main strength of Toyota is no longer in its production system but in its New Product Development (see "The Machine That Changed the World" and TPPDS book by Allen Ward, etc.)
- But "Lean Engineering" is only possible once permanent fire fighting has been more or less eradicated. Otherwise people will never find the time to "do" Lean Engineering.
- We recommend that companies start by putting their development process under control using the Critical Chain and then begin their Lean Engineering journey.
- Critical Chain to finish your projects on time and efficiently
+ Lean Engineering to develop good products.

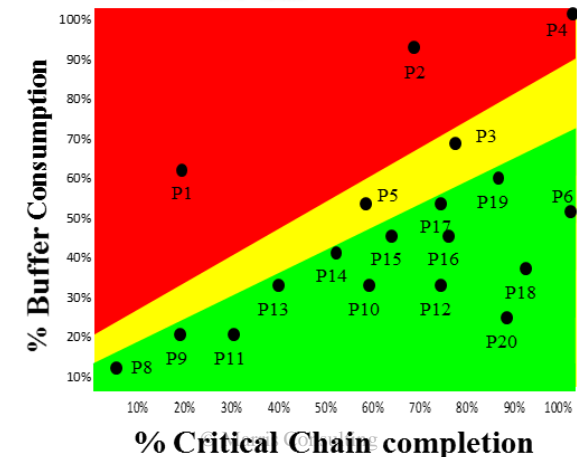


Extract

Summary of the Critical Chain way of managing project portfolios:

- The only important goal is to finish your projects on time, within budget and conform to specifications.
- Safety buffers are reduced and mutualized into project and feeding buffers.
- Monitoring of project execution with a Fever Chart: a simple and efficient visual management.
- Ensuring the proper and smooth execution of Critical Chain tasks (relay race and mascots) to execute projects faster.
- Projects are sequenced to limit the work in progress and devastating multitasking. We avoid launching projects too soon.
- Resource conflicts between projects can be easily, objectively and dynamically managed using the Fever Chart.
- Thanks to the focus on the capacity constraint the productivity of the whole business increases significantly.

Results	Average
Project durations	- 39%
Number of projects completed in a given time	+ 70 %
Throughput	+ 53%

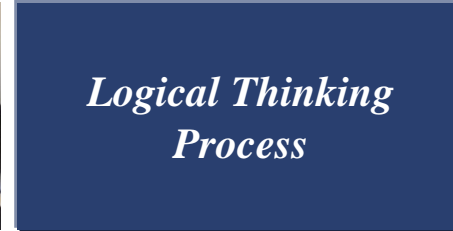


*Critical Chain enables you to take control of your projects portfolio...
...do you dare to finish all your projects on time?*

Extract

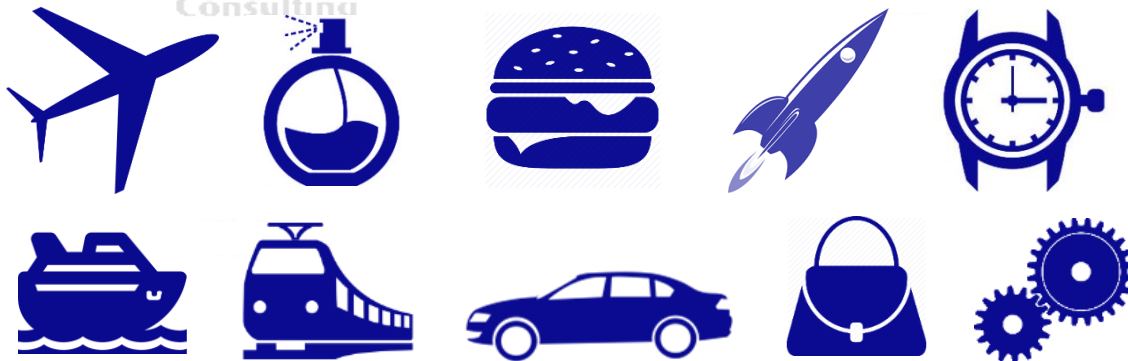
Marris Consulting hosts over 30 public or internal training sessions every year

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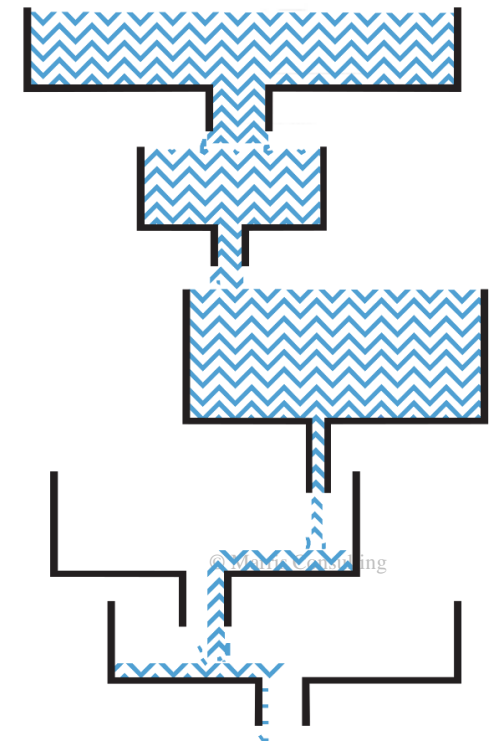


What we do

- Marris Consulting has a reputation for its capacity to be pertinent in nearly all kinds of industry. We have worked in over 200 companies helping in designing, making, selling and distributing:
 - cars, hamburgers, aeroplanes, 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 defence 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.



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How we do it

- We understand that the hardest part of what we do is to change "people". Apart from the pertinent ideas that we must have we must directly and indirectly change individual and collective behaviour.
- 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 analyse 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 practise.
- We like simple solutions. Simple is beautiful.



Philip Marris presents the
38th TOCPA Conference program



Theory of Constraints marketing & awareness activities

■ 5 Permanent news websites (www.Scoopit.com)

- Theory Of Constraints (English & French)

■ Critical Chain in (English & French)

- TLS: ToC + Lean + Six Sigma

■ >200 free videos (YouTube Channel)

■ Discussion Groups (LinkedIn)

- Critical Chain
- TLS: ToC, Lean and Six Sigma

■ 2 dedicated websites in French

- ToC in Production
- ToC in Projects

■ Others:

- Twitter, Facebook, Viadeo, Etc.

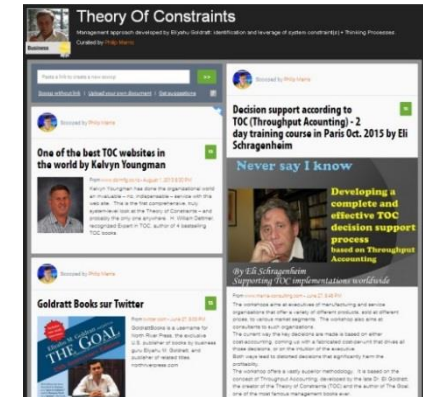
Scoop.it!

YouTube

LinkedIn

twitter

facebook



Extract

We are honoured to have been able to help...



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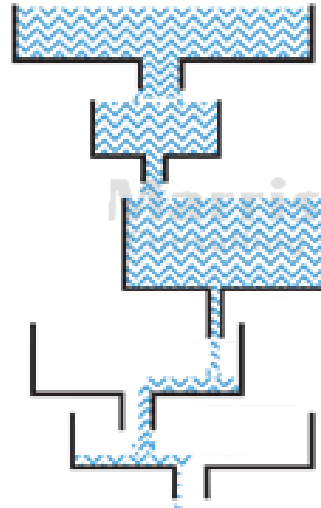
Marris Consulting

Factories, People & Results

Tour Maine Montparnasse
27th floor
33, avenue du Maine
Paris 75015
France
Tel. +33 (0) 1 71 19 90 40



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ToC + Lean workshops in Paris
Using Theory of Constraints to boost your Lean programme

Learn how Constraints Management can greatly improve your performance and how to integrate ToC into a Lean programme.

[More info](#)

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: $1 + 1 = 3$

We help our clients reach and maintain ambitious levels of performance by combining actions on processes, organization, methodologies, tools ... and people from the shop floor to the board room.

We are recognized experts in **Constraints Management**. We promote an integrated approach that combines **Theory of Constraints (ToC)** to identify where to act and **Lean** and Six Sigma to improve performance.

We also use ToC's **Critical Chain Project Management (CCPM)** approach to boost project performance especially for New Product Development portfolios. We sometimes combine this with **Lean Engineering** (a.k.a Toyota New Product and Process Development System).

Our motto: Factories, People & Results.

Project focus
A Theory of Constraints assignment: CCPM in MRO
Discover how Marris Consulting helped an aircraft manufacturer divide by two the time required for aircraft maintenance. Watch the video interview of our client.

Latest publication
6 signs you should consider managing your constraints
If you recognize your company in one of these statements you should probably consider better managing your constraints.

Discover all our training courses
Marris Consulting propose more than ten training sessions per year
Find here all the informations about the training "Theory of Constraints + Lean", "Critical Chain Project Management", "Lean Management", "Lean Manufacturing", "Logical Thinking Process"...

Video of the month
Johan Steyn, guest of Marris Consulting
Johan Steyn, Managing Director of South African Aeronautics and Philip Marris talk about the progress made using the Theory of Constraints.

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