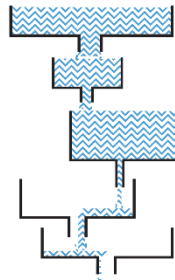




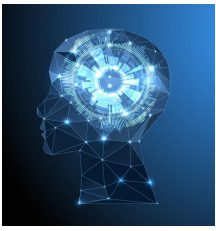
Using Artificial Intelligence in a Logical Thinking Process Analysis

Marris
Consulting



Paris, Monday 26th of June 2023

Version 1.0



Organization of the webinar

- Presentation: 45 minutes
- Question & Answer session: 15 minutes
- You can ask questions and make written comments throughout the webinar using the "Q. and A." feature at the bottom of the screen
- The link to a PDF download will be proposed at the end of this webinar
- The webinar is managed by 3 people:
 - **Philip Marris and Thorsteinn Siglaugsson, the “speakers”.**
 - **And a webinar manager whose role is:**
 - To read and answer the written questions as the webinar progresses
 - To manage the technical part of the webinar (surveys, opening / closing the microphone, etc...)

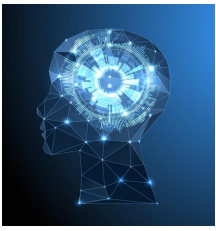


Please note that a replay of the webinar will also be available on our Youtube channel in the coming days.

Philip Marris: CEO of Marris Consulting

- Partnered with, Bill Dettmer, the founder of the Logical Thinking Process in 2012.
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- Certified in the LTP & organizer of dozens of inter & intra company LTP training sessions including the “Paris Sessions”.
- Set up with Bill Dettmer and Thorsteinn Siglaugsson in 2022 the LTP online course.
- Has been implementing Theory Of Constraints (TOC) since 1986, when he worked with Eliyahu Goldratt, the founder of TOC and author of the book *The Goal*.
- Implementation TOC + Lean in more than 300 companies around the world.
- Author of the French reference book on TOC: *Le Management Par les Contraintes*.





Thorsteinn Siglaugsson

- Certified expert in *The Logical Thinking Process*
- Partner with LTP founder William (Bill) Dettmer
- With Bill Dettmer, he coaches the students of the LTP online course.
- Author: *From Symptoms to Causes – Applying the Logical Thinking Process to an Everyday Problem*
- Training, consulting, research
- Co-operating with Marris Consulting, Paris
- Over 20 years experience in planning, budgeting and analysis, including Beyond Budgeting training
- Blog: *The Edge of Reason* on Substack
- BA Philosophy
- INSEAD MBA

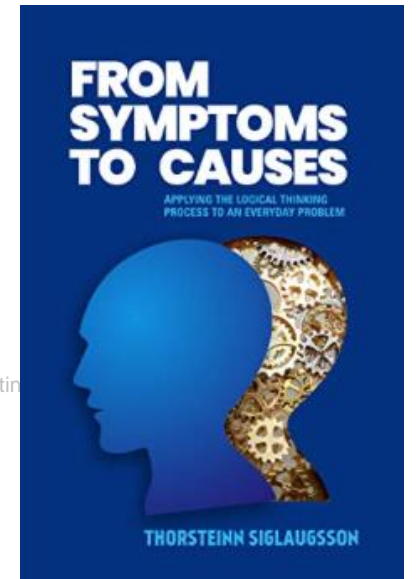




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- Decision-making and qualitative versus quantitative information
- Large Language Models (LLMs)
- Logical qualitative analysis / LTP / TOC TP
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Explicit and tacit knowledge

■ Quantitative modeling

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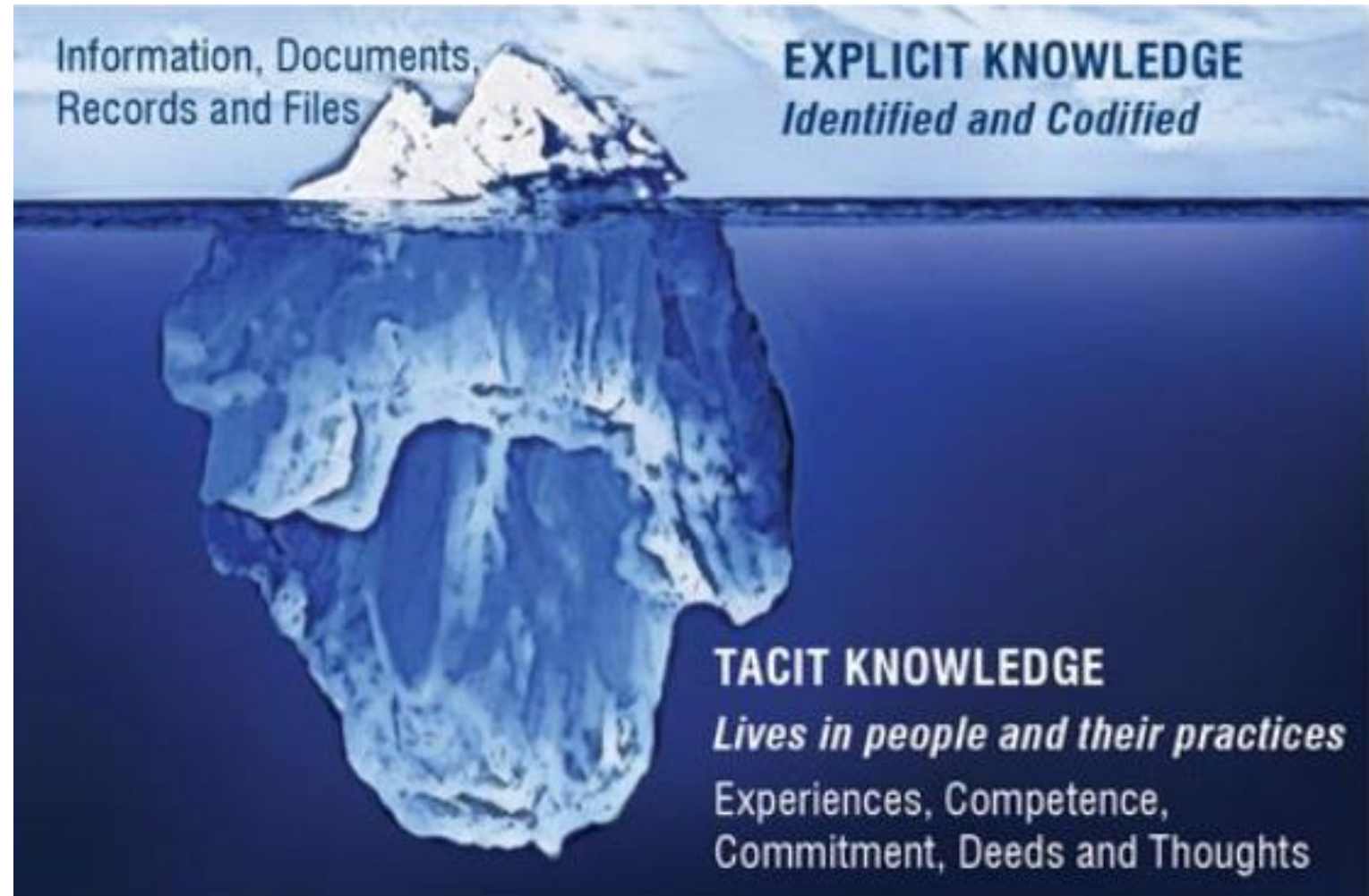
- Understand trends
- Discover correlations
- Remove bias from predictions

■ Limitations of quantitative modeling

- Data availability and quality
- Leaves out tacit knowledge

knowledge. Tacit knowledge, in particular, is lost through outsourcing, downsizing, mergers and terminations. **Reportedly, 90 percent of the knowledge in any organization is embedded and synthesized in peoples' heads** (Wah, 1999b; Bonner, 2000a; Lee, 2000). Most tacit knowledge is an invisible line item in corporate budgets. However, it is tacit knowledge that plays a key role in

https://www.uky.edu/~gmswan3/575/KM_roles.pdf



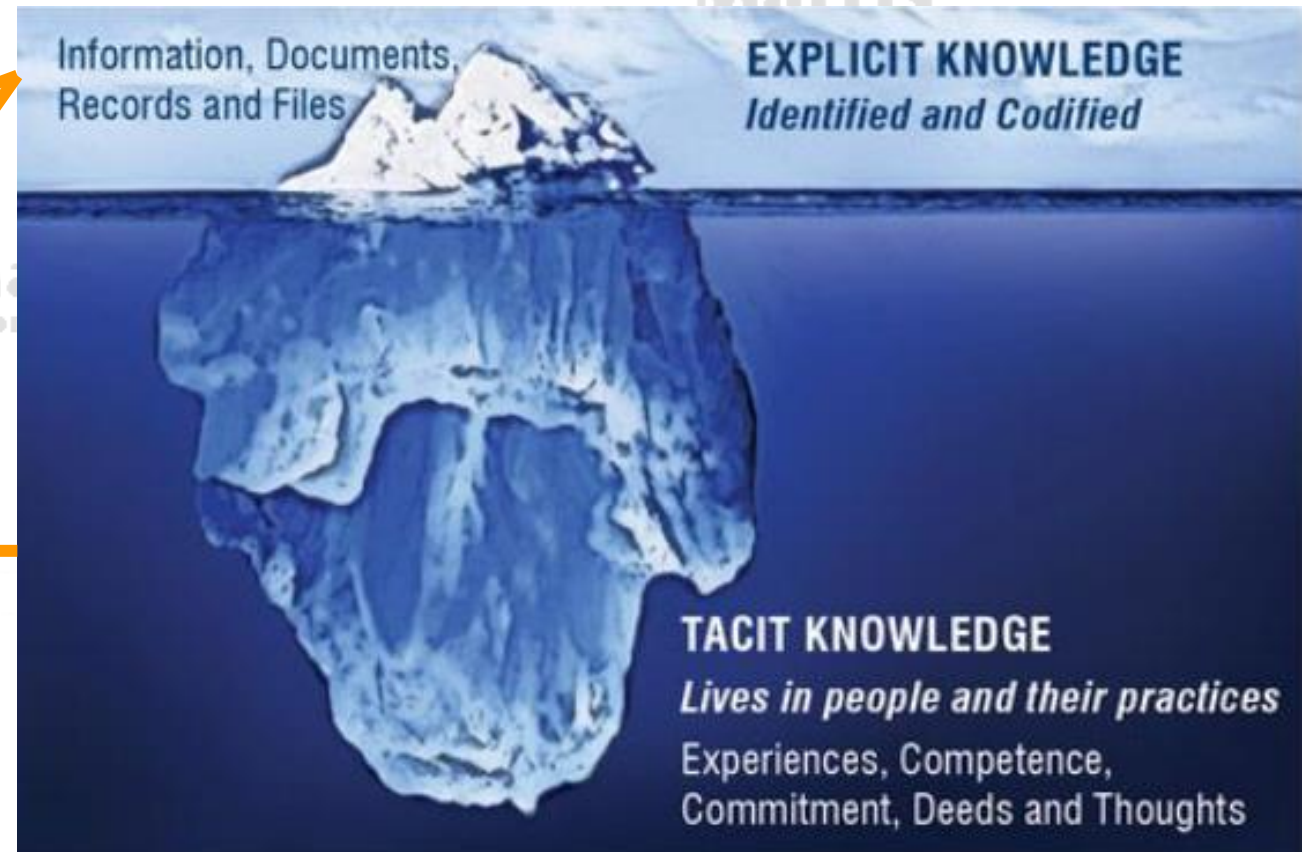


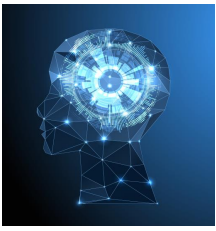
Quantitative versus qualitative modeling

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Quantitative
modeling

Qualitative
reasoning

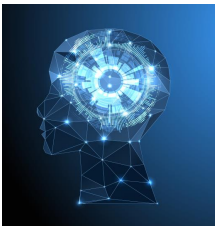




The challenges of qualitative decision making

- The process is most often unstructured
- The decision-making process is usually not documented
- Validation of information often omitted or unsatisfactory
- Most structured methods lack logical rigour
- Rigorous cause-effect analysis is hard and time consuming
- Decisions are tainted by conscious or subconscious biases
- The problem in a nutshell:
 - We must make decisions
 - The availability of explicit knowledge is very limited
 - We must rely on tacit knowledge
 - We are bad at making use of tacit knowledge

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Possible solutions

- Decision-making becomes data driven to a greater extent
 - Improvements can be made
 - All relevant tacit knowledge will never be incorporated into models
- Improve qualitative analysis
 - Logical rigour is the key
 - How do we overcome the difficulty of logical analysis?
- Large Language Models may be a game-changer

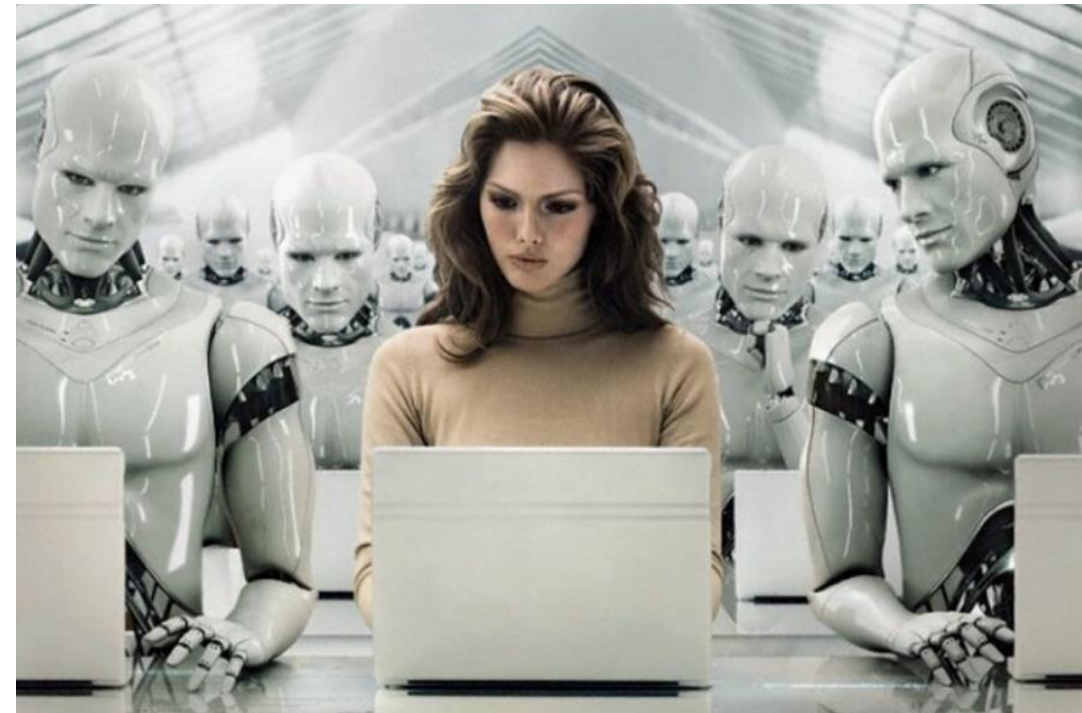




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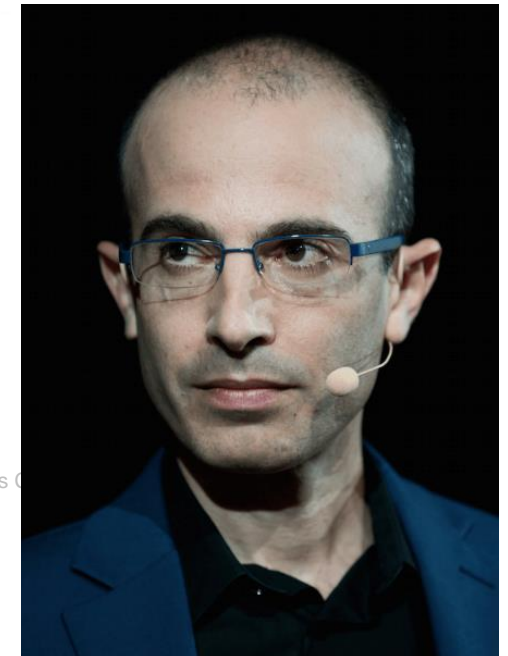
AI has been around for a long time – so, what is changing?

■ What is a Large Language Model (LLM)?

- Neural network
- Trained on a huge amount of data
- Mimics human response to prompts (questions/commands)
- Can perform complex tasks that require evaluation of options and choices (Auto GPT)

■ The worries in 2023

- March: Six month pause demanded, 30k signatories now
- May: 80 AI experts warn of risk of extinction
- May: Open AI stops the development of ChatGPT 5 for the time being
- Yuval Noah Harari: “AI has hacked the operating system of civilisation”





AI has been around for a long time – so, what is changing?

■ The worries

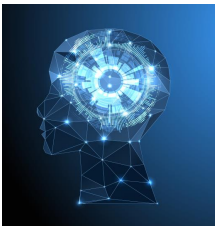
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- Flood of uncontrollable propaganda and untruth
- Cannot distinguish between human and AI
- Job losses, not only low level but high-level jobs
- Threat from Artificial General Intelligence

■ How can we react?

- Panic and try to stop it
- Stick our heads in the sand
 - “AI responds with wrong answers” ... “isn’t self-conscious” ... “doesn’t have free will” ...
- Face reality
 - Here to stay
 - Will change our jobs and lives fundamentally
 - **How can we take advantage of LLMs?**

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AI has been around for a long time – so, what is changing?

■ The main strengths of LLM

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- Ability to credibly answer almost any question
- Ability to write, analyse and summarise texts
- Ability to evaluate cause-effect statements

■ The limitations of qualitative analysis

- The process is most often unstructured
- The decision-making process is usually not documented
- Validation of information often omitted or unsatisfactory
- Most structured methods lack logical rigour
- Rigorous cause-effect analysis is hard and time consuming
- Decisions are tainted by conscious or subconscious biases

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The Logical Thinking Process

■ The process

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- What is our goal and which requirements for reaching it have we not fulfilled?
- What are the root causes preventing us from fulfilling them?
- Which (if any) conflicts prevent us from eliminating the root causes and how can we solve them?
- How will our solutions ensure we reach the goal?
- What precise actions must we take to implement the solutions?

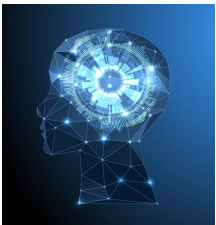
■ The foundations

- Structured approach
- Visual analysis
- Rigorous logic

■ Challenges

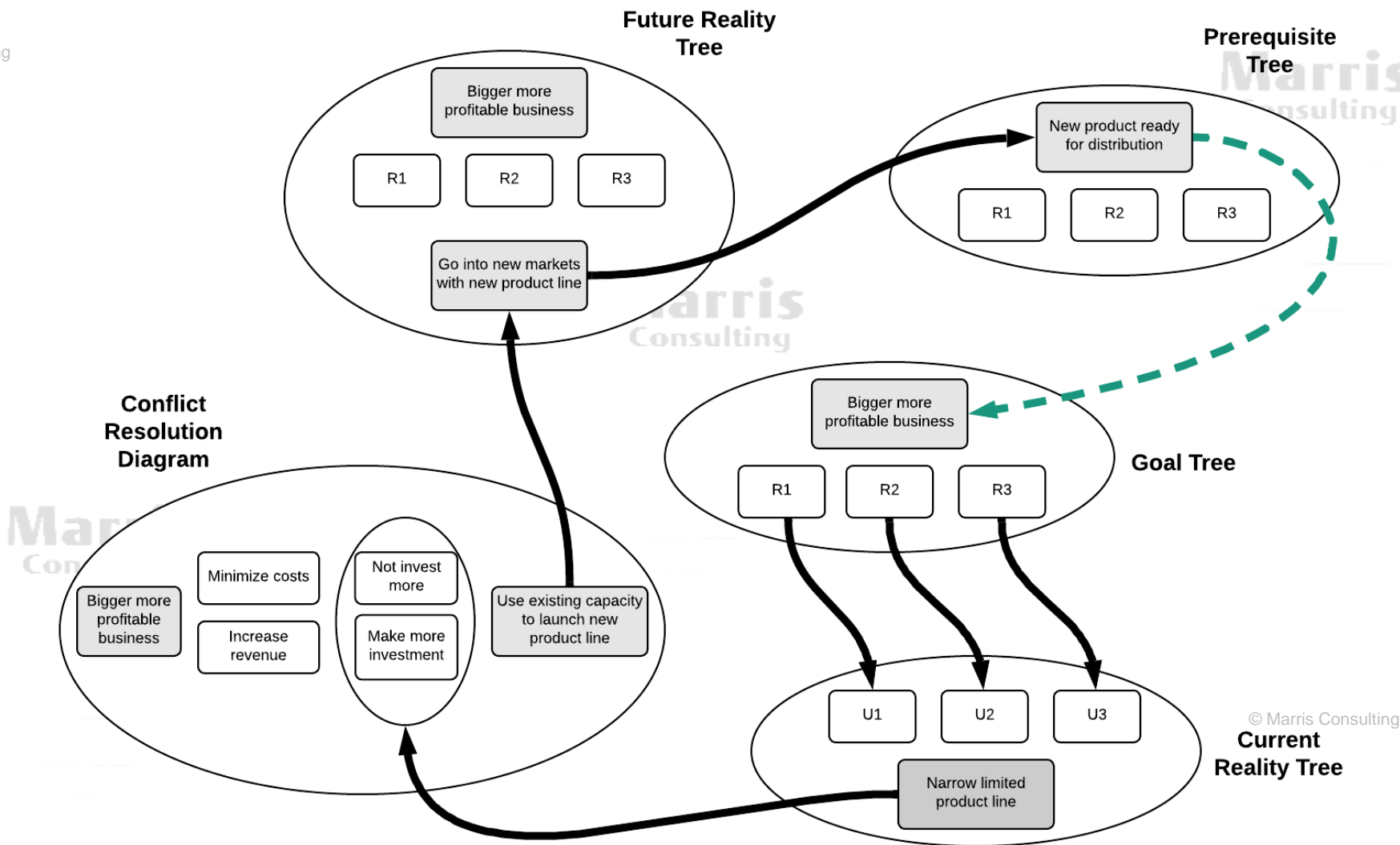
- A well executed, valid analysis will take us closer to the goal, but...
- ... it requires training
- ... it is time consuming

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The Logical Thinking Process

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AI and the limitations of qualitative analysis

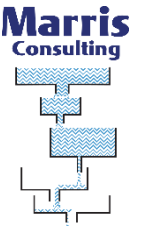
■ Where does AI come into the picture?

- ... Speed up initial analysis
 - Create draft analysis
 - Summarise and simplify complex cases
- ... Scrutinise logical connections
- ... Look out for missing premises
- ... Clarify statements
- ... Simplify logic trees

■ What do we gain?

- Faster analyses – time is an important impediment
- More robust logic trees – logical validity is crucial
- **Honing our own logic and language skills**

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Examples

- Example 1: Draft analysis
- Example 2: Prompts
- Example 3: Leaps of logic (long arrows)
- Example 4: Current Reality Tree

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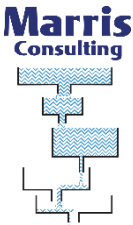
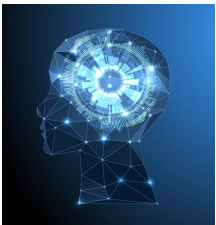
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Example 1: Draft analysis

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My goal is to get a high-paying job in the field of artificial intelligence. What are the three to five critical success factors that must be fulfilled to achieve this goal?



To achieve your goal of obtaining a high-paying job in the field of artificial intelligence, several critical success factors must be fulfilled. Here are three key factors to consider:

1. Education and Skill Development: Acquiring a strong educational foundation and developing relevant skills in artificial intelligence is crucial. Pursuing a degree or certification program in computer science, data science, machine learning, or a related field can provide you with the necessary theoretical knowledge. Additionally, gaining practical experience through internships, research projects, or personal projects can demonstrate your skills and expertise to potential employers.
2. Technical Proficiency and Specialization: Building a deep understanding of artificial intelligence techniques, algorithms, and tools is essential. Focus on developing expertise in areas such as machine learning, natural language processing, computer vision, or robotics, depending on your specific interests. Stay up to date with the latest advancements in the field, explore open-source projects, and contribute to relevant communities or forums. Employers highly value candidates with specialized skills and practical experience in applying AI technologies to real-world problems.
3. Professional Networking and Industry Engagement: Establishing a strong professional network within the artificial intelligence industry can significantly enhance your job prospects. Attend industry events, conferences, and meetups to connect with experts, researchers, and potential employers. Engage in online communities, participate in relevant forums, and contribute to AI-related discussions. Networking can provide valuable insights, mentorship opportunities, and access to job openings that may not be publicly advertised.

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Example 2: Prompts

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Is this a valid syllogistic conclusion: If I open the door of the cage, the bird will fly out.



Yes, the syllogistic conclusion "If I open the door of the cage, the bird will fly out" is valid. It follows a valid form of a conditional statement (if-then statement), where the opening of the door (antecedent) implies the bird flying out (consequent). As long as the premise "I open the door of the cage" is true, the conclusion logically follows.



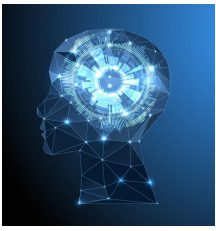
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Is the premise sufficient to unavoidably lead to the conclusion? Premise: "I open the door of the cage" Conclusion: "The bird flies out of the cage"



Yes, based on the given premise "I open the door of the cage," the conclusion "The bird flies out of the cage" necessarily follows. When the door of the cage is opened, it allows the bird to have the opportunity to fly out. Therefore, if the premise is true, it guarantees the occurrence of the conclusion.





Example 2: Prompts

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Identify all the underlying premises for the following syllogistic conclusion: "The bird flies out of the cage" Assume that one of the premises is: "I open the door of the cage"

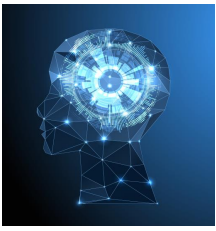


Based on the given conclusion "The bird flies out of the cage" and the premise "I open the door of the cage," we can identify the following underlying premises:



1. Birds are capable of flying.
2. The bird is inside the cage.
3. The door of the cage is closed.
4. Opening the door of the cage allows the bird to exit.
5. When a bird is no longer confined inside a closed cage, it will fly out.

These premises collectively support the conclusion that "The bird flies out of the cage" when the door of the cage is opened.



Example 3: Leaps of logic

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Please evaluate the logical validity of the following statement: Premise: I buy chocolate ice cream. Conclusion: My car won't start



The logical validity of an argument depends on the structure of the argument rather than the truth of the premises or the conclusion.



In the statement you provided, "Premise: I buy chocolate ice cream. Conclusion: My car won't start," there is no logical connection or relationship between the premise and the conclusion. The premise of buying chocolate ice cream does not logically lead to the conclusion that your car won't start.

Therefore, the argument you presented is not logically valid. The conclusion does not follow logically or necessarily from the given premise.



Example 3: Leaps of logic (and creativity?)

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Are there some potential intermediate steps or additional causes that might make the conclusion valid?



Yes, it is possible to identify potential intermediate steps or additional causes that could make the conclusion valid. In order to establish a logical connection between the premise and the conclusion, one would need to introduce an additional premise or causal relationship. Here's an example:

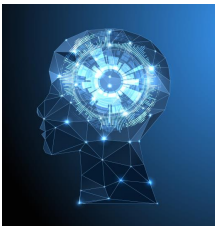
Premise 1: I buy chocolate ice cream.

Premise 2: Eating chocolate ice cream triggers a severe allergic reaction for me.

Conclusion: My car won't start (because I experience an allergic reaction and cannot operate the car).

In this revised scenario, the additional premise (Premise 2) introduces a causal relationship between eating chocolate ice cream and experiencing a severe allergic reaction. The severe allergic reaction could then lead to an inability to operate the car, resulting in the conclusion that the car won't start.

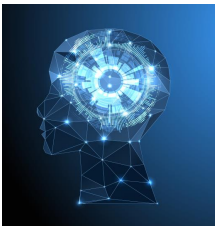
By incorporating this intermediate step and the causal relationship, the conclusion becomes logically valid within the context of the provided premises.



Example 4: Current Reality Tree

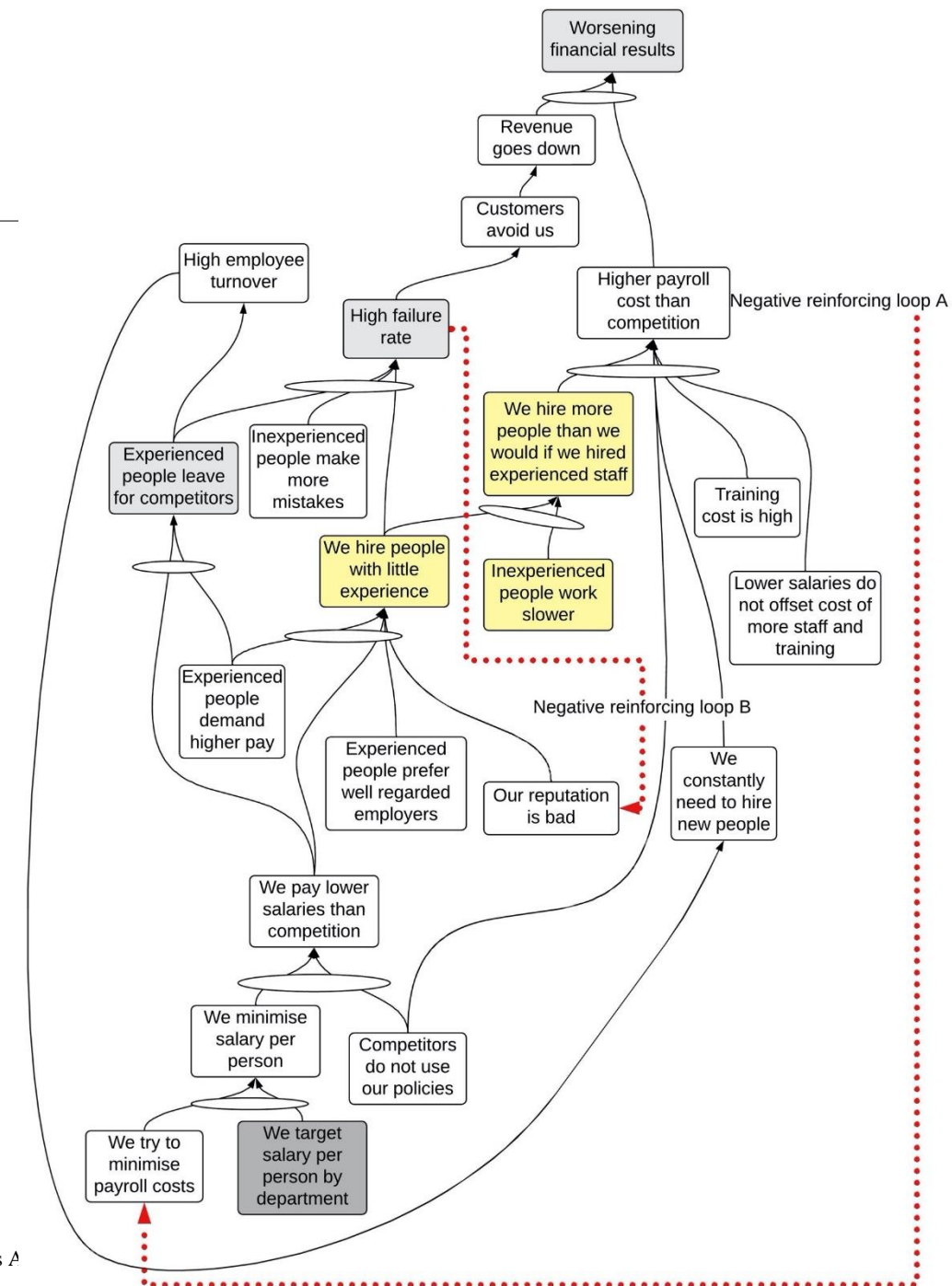
- What we call “problems” are usually symptoms of underlying systemic root causes
 - Potholes in roads? Wrong incentives cause use of poor materials.
- To eliminate the symptom, the systemic root cause must be identified and removed
 - Very often the root cause is a hidden assumption
 - Articulating the assumption is often key to the solution
- Root cause analysis that does not adhere to logical rigour only serves to confirm existing bias
 - Small steps of direct unavoidable cause-effect relationships
 - The reason the 5 Whys doesn't really work
- Challenges
 - Bias may lead us to overlook crucial but wrong assumptions
 - We may overlook invalid logical connections
 - Entities may lack clarity in wording
 - Remember: One error in the “right” place may invalidate the whole analysis

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Example 4: Current Reality Tree

- System: Specialized hospital
- Undesirable effect: Worsening financial results
- We have identified a root cause
- Are all logical connections tight?
- Are any assumptions missing?
- Let's see what ChatGPT has to say
 - Focusing on the syllogism in yellow:
 - “IF we hire people with little experience AND inexperienced people work slower THEN we hire more people than we would if we hired experienced staff”





Example 4: Current Reality Tree

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Is this statement logically valid? "If we hire inexperienced people and if inexperienced people work slower than experienced people, we must hire more people".



Yes, the statement "If we hire inexperienced people and if inexperienced people work slower than experienced people, we must hire more people" is logically valid. The statement follows a valid logical form known as modus ponens, which is a rule of inference in propositional logic.

Modus ponens states that if we have a conditional statement in the form "If A, then B" (in this case, "If we hire inexperienced people and if inexperienced people work slower than experienced people") and we also have the affirmation of the antecedent (in this case, "We hire inexperienced people and inexperienced people work slower than experienced people"), then we can validly conclude the consequent (in this case, "We must hire more people").

In other words, if we accept the premises of the statement as true, then the logical conclusion that we must hire more people follows logically. However, it's important to note that logical validity does not necessarily imply the truth or practicality of the conclusion in real-world scenarios. Context, feasibility, and other considerations may need to be taken into account to determine the best course of action.



Example 4: Current Reality Tree

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If we hire inexperienced people and if they work slower than experienced people, does it necessarily follow that we must hire more people? What other conditions must be fulfilled for this to be true?



No, it does not necessarily follow that we must hire more people solely based on the premise that inexperienced people work slower than experienced people. Several other conditions need to be fulfilled for it to be true that hiring more people is the appropriate solution. Here are a few factors to consider:

1. **Workload:** It is essential to assess whether the current workload justifies the need for additional employees. If the workload exceeds the capacity of the existing workforce, hiring more people may be a reasonable consideration.
2. **Time constraints:** If there are strict time constraints and the slower pace of inexperienced employees hinders meeting deadlines or project timelines, then hiring additional staff could be a viable solution.
3. **Training and development:** Evaluating the effectiveness of training programs becomes crucial. If the organization has the capacity and resources to provide adequate training to inexperienced employees and expects them to improve their productivity over time, hiring more people might not be necessary.
4. **Cost-effectiveness:** Hiring new employees comes with costs such as recruitment, training, and onboarding. It is important to consider whether the investment in additional staff will yield long-term benefits and be cost-effective in comparison to alternative approaches like training and upskilling existing employees.
5. **Team dynamics and coordination:** Adding more people to the team can impact the dynamics and coordination. Assessing the potential effects on teamwork, communication, and productivity is important to ensure that hiring more people will actually improve overall performance.

In summary, hiring more people should not be an automatic response to inexperienced employees working slower than experienced ones. It is crucial to evaluate the specific circumstances, workload, time constraints, training opportunities, cost-effectiveness, and team dynamics to determine the most appropriate solution.

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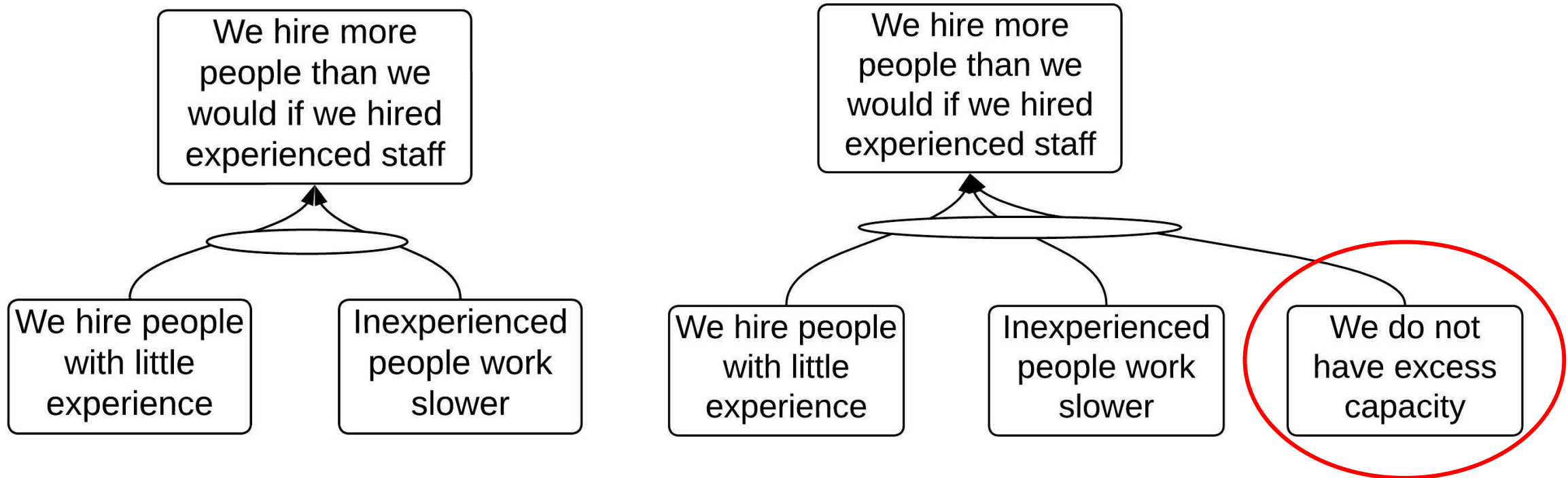
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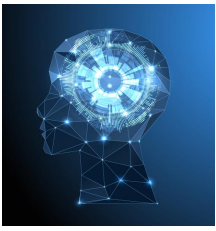
Example 4: Current Reality Tree

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Example 4: Current Reality Tree

- The original statement had a missing premise
- Chat GPT pointed us towards a missing premise
- Is the premise valid?
- If not, what does it mean for the analysis?
 - We have excess capacity
 - We do not necessarily have to hire more people even if our hires are inexperienced, but we still do
 - Ignoring the implications of our excess capacity may be an important root cause

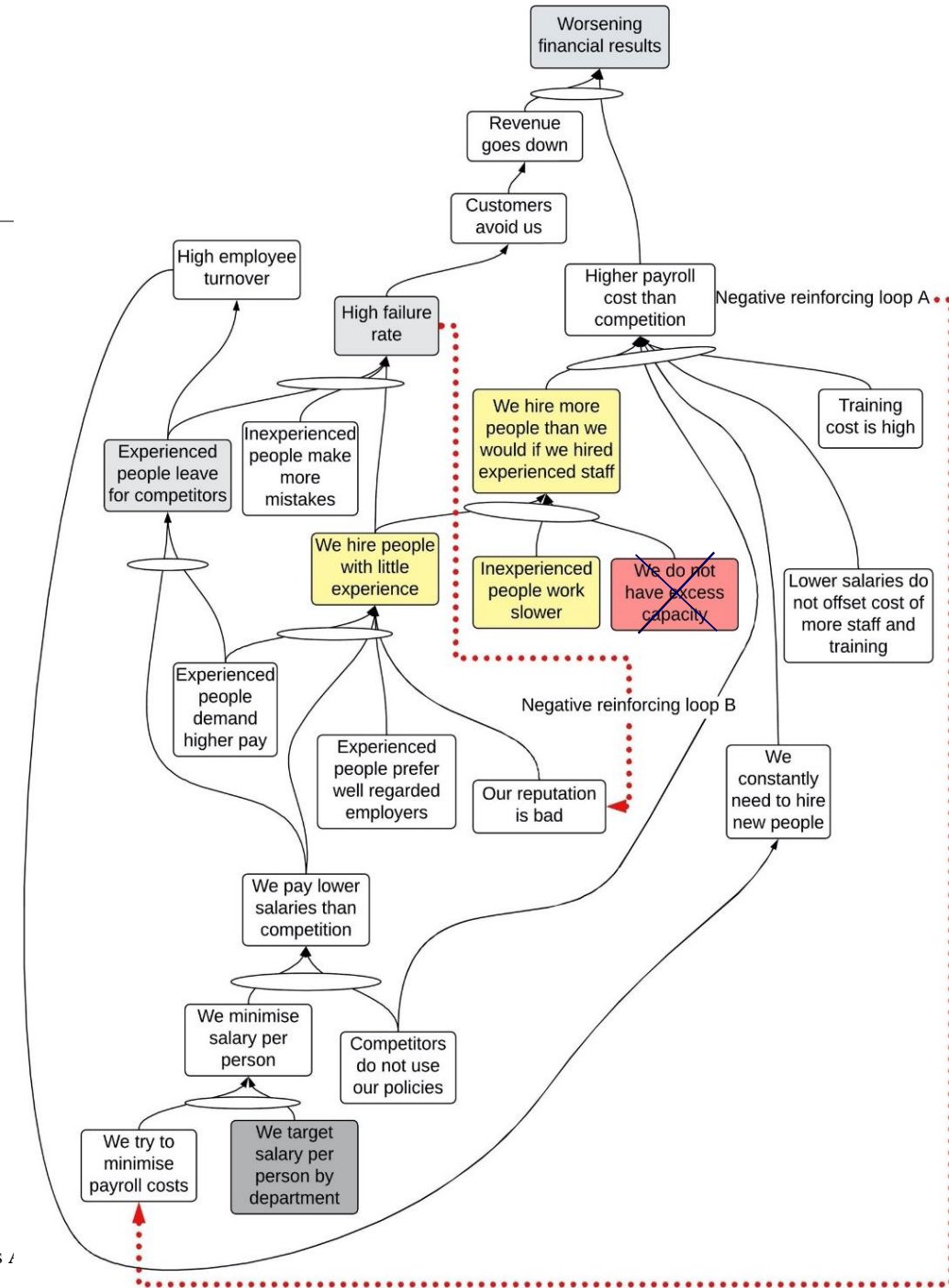




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AI and logical analysis - key points

■ How can LLMs assist with logical analysis?

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- Identify missing premises
- Evaluate the validity of logical connections
- Simplify and clarify statements
- Tighten cause-effect chains – get rid of “long arrows”

■ What is the value of using LLMs for this purpose?

- Minimise the risk of unconscious bias
- Speed up scrutiny of logic trees
- Speed up drafting of logic trees
- Improve our own clarity of thinking

■ Important to keep in mind ...

- LLMs are not perfect
- Prompting correctly is key differentiator
- Must have existing knowledge of logic
- Must use structured approach

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AI has been around for a long time – so, what is changing?

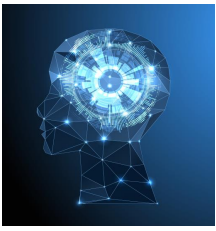
■ The choices we have

- Outsource our thinking to AI
 - Vicious cycle of losing control
- Use the power of AI to improve our thinking
 - Virtuous cycle of mastering thought and language

■ What we need

- A large language model
 - Chat GPT 4.0
 - Specialised models, example BlueDolphin GPT <https://dolphingpt.ai/>
- Knowledge of the rules of logic
- A structured approach for analysis
 - Logical Thinking Process
 - TOC Thinking Processes

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Upcoming online training course: Harnessing Artificial Intelligence to Boost Qualitative Reasoning

- Prerequisites: Basic knowledge of LTP or TOC TP
- Type: Self-paced online course with trainer feedback on exercises and questions
- Length: 4 hours, including exercises
- Objectives:
 - Understand how Large Language Models (LLMs) can help with logical reasoning, their strengths and limitations
 - Understand how to correctly prompt LLMs
 - Gain hands-on experience using LLMs with all five Logical Thinking Process tools
- Structure
 - Lectures
 - Examples
 - Practical student assignments

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LTP online training course by Bill Dettmer

- Course designed by Bill Dettmer
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- Two versions
 - Videos and exercises only
 - Full course with 6 hours of coaching by Bill Dettmer and Thorsteinn Siglaugsson

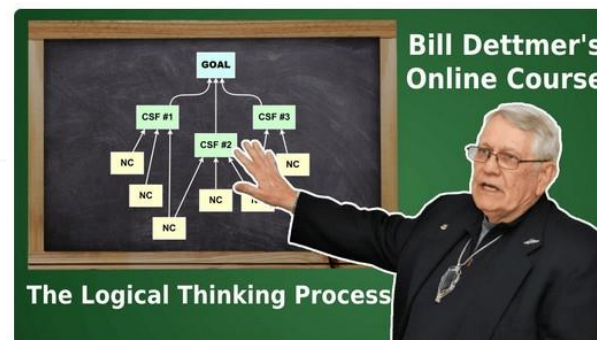
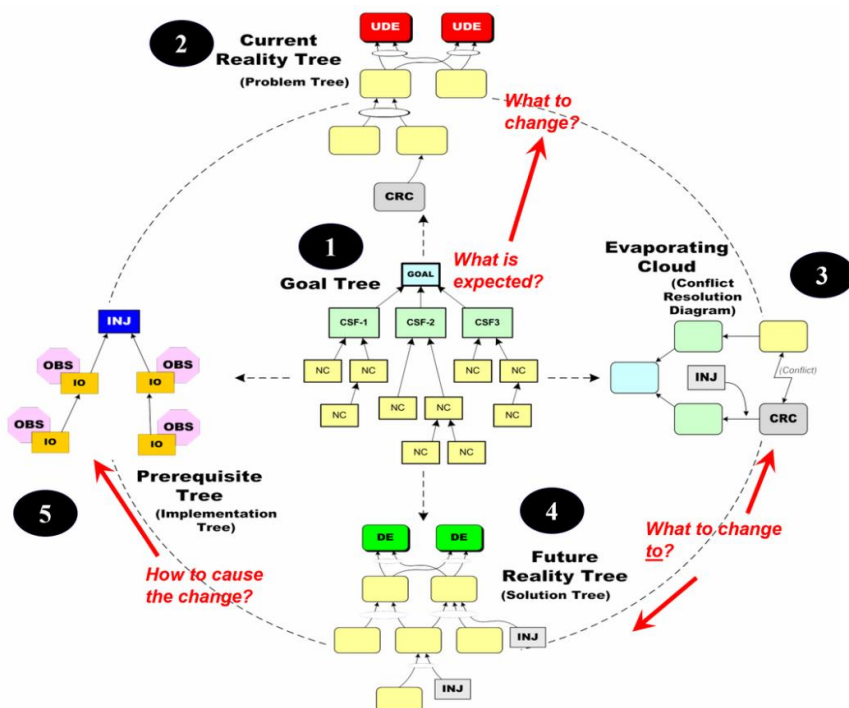
The Logical Thinking Process

« A structured way to move from an ill-defined system level problem to a fully implemented solution »



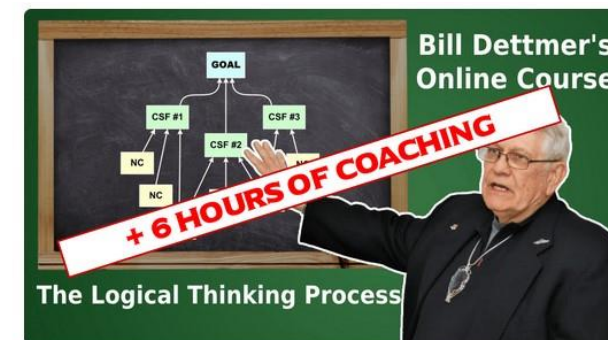
<https://logicalthinkingprocess.podia.com/>

Bill Dettmer



Video course - The Logical Thinking Process (videos only)

38 Lessons • 365-day access



Video course - The Logical Thinking Process (videos + 6h of coaching)

Course • 49 Lessons • 365-day access



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Thank you for your time

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Do you have any questions?

Feel free to ask to connect on LinkedIn

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





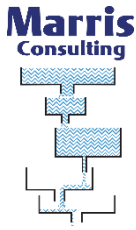
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 - To go further

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Lexicon

Acronym	Meaning
LTP	Logical Thinking Process
TOC TP	Theory of Constraints Thinking Processes
LMM	Large Language Model
AI	Artificial Intelligence
FRT	Future Reality Tree
CRT	Current Reality Tree
CRD	Conflict Resolution Diagram
GT	Goal Tree
PT	Prerequisite Tree

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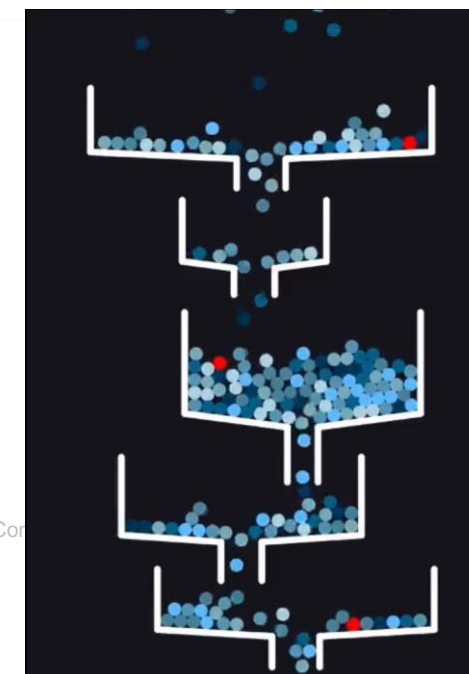
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Presentation of Marris Consulting

- 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.
- The founder, Philip Marris, is a renowned specialist in Theory of Constraints, Lean and industrial performance.
- We work on all industrial components, including:
 - manufacturing (machine performance, production management, TPM, etc.),
 - supply chain (physical flows, forecasts, planning, inventory management, etc.),
 - product/process research, development and industrialization,
 - sales (sales efficiency, optimization of resources).
- Marris Consulting is based in Paris, but operates throughout France, Europe and around the world
 - In France : Lille, Marseille, Bordeaux, Strasbourg, Paris, Eu, St. Florentin, La Ciotat, Crépy-en-Valois, and so on...
 - Abroad: Switzerland, South Africa, England, Spain, Czech Republic, USA, Romania, Vietnam, and so on...





Presentation of Marris Consulting

- Some key figures:

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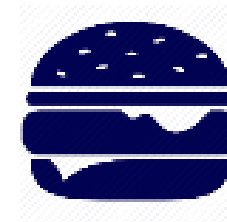
- A team of 15 consultants and a network of partners.
- >40% of our business outside France.
- More than 40 conferences and training sessions a year on operational performance, Theory of Constraints (TOC), Lean, Critical Chain Project Management (CCPM)...

- Marris Consulting has a reputation for its ability to be pertinent in all kinds of industry. We have worked in over 400 companies helping in designing, making, selling and distributing:

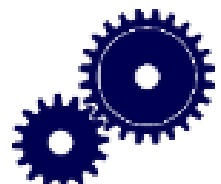
- cars, hamburgers, airplanes, perfume, trains, rockets, industrial equipment, pharmaceuticals, home delivery services, computer chips, chips (food), maintenance / repair / overhaul (MRO) of planes and trains, luxury handbags, corrugated cardboard production, the defense industry, Swiss watches, steel 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.



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How we operate

- 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 behavior.
- We work simultaneously at all levels of the company from the front line to the board room.
- We are recognized experts in Operations improvement approaches: Lean (manufacturing/engineering/management), Theory of Constraints, Six Sigma, Industrie 4.0, Agile, 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.*



Marris Consulting organizes more than 40 inter and intra-company training session per year

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Marris Consulting's online trainings courses

Marris Consulting's Online Training Courses

Welcome to our e-learning platform!

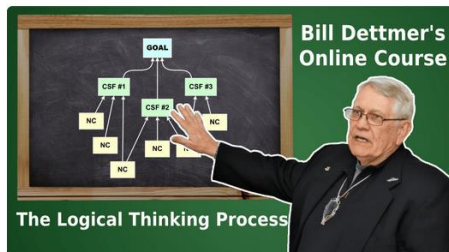
Here you can learn more about our online training offers:

Theory Of Constraints, Lean Management, Critical Chain Project Management.

Marris Consulting is a consulting and training company focused on significantly and sustainably improving the performance of manufacturing and process industries.

[Learn more about Marris Consulting](#)

Enhance your expertise on key elements to increase your performance



Video course - The Logical Thinking Process (videos only)

38 Lessons • 365-day access

Learn how to use the Logical Thinking Process, a systems approach to complex problem solving (video course only). You will get access to the videos during 12 months.

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Good Lean Bad Lean

Training about understanding what is true Lean, the "Toyota Way", and how to implement it and reach their level of performance, thanks to the expertise of the ex-Vice President of Manufacturing of Toyota Motor Manufacturing France.

AVAILABLE NOW!

Theory Of Constraints

Training to understand the key principles of this approach and get some practical advice to implement it. The Theory Of Constraints was developed by Eliyahu Goldratt and popularised thanks to the global best-seller The Goal, the first business novel.

AVAILABLE SOON!

Critical Chain

Training for anyone who wants to finish their projects on time, faster, on scope and on budget. Learn how to schedule and manage projects and portfolio of projects the Critical Chain way and benefit from our experience and lessons learnt from hundreds of projects.

AVAILABLE SOON!



Good Lean Bad Lean

Course • 47 Lessons • 365-day access

Learn how to use the Good Lean principles, avoid the traps of Bad Lean and become an expert. You will get access to the videos during 12 months upon purchase.

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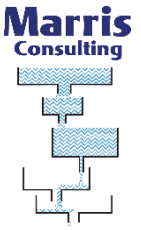
LTP Online training: <https://logicalthinkingprocess.podia.com/>

TOC, CCPM & Lean Online trainings: <https://e-learning.marris-consulting.com/>



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To get more information: our website marris-consulting.com



Factories,
People
& Results



Theory of Constraints, Critical Chain Project Management, Lean : industry consulting & training - Marris Consulting

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2-day Flash Diagnosis

Would you like our expert advice on how to go faster and further?

We can help you to quickly identify the best levers to improve performance

[More information →](#)

Theory of Constraints (ToC) and Critical Chain Project Management (CCPM) experts

Marris Consulting, Experts in the Theory of Constraints consulting & training

Welcome to the Marris Consulting website, an industry consulting and training company focused on significantly and sustainably improving the performance of manufacturing and process industries.

Our 2-day performance 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 **performance diagnosis** led by Philip

To find out more: our customers' testimonials



Client testimonial
Lakshmi Subbaraya



client testimonial
ABS JETS



témoignage client
McDonald's



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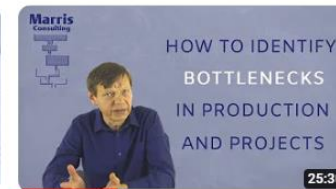
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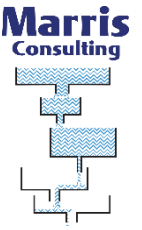
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Factories, People & Results

Tour Maine Montparnasse

27th floor

33, avenue du Maine

Paris 75755 Cedex 15

© Marris Consulting

France

Tel. +33 (0) 1 71 19 90 40

www.marris-consulting.com