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Dedication



**** FÜR ALLE TEILNEHMER DER „MAXPERT IN TOUCH '24“-REIHE UND ALLE MENSCHEN AUF DER GANZEN WELT, DIE DANACH STREBen, ZU WACHSEN – UND ANDEREN BEIM WACHSTUM ZU HELFEN ** OB SIE DAS PROJEKTMANAGEMENT NUN MIT AGILEN, TRADITIONELLEN METHODEN ODER EINER MISCHUNG AUS VERSCHIEDENEN STILEN ANGEHEN, ES GEHT IMMER DARUM, EINEN ECHTEN MEHRWERT ZU SCHAFFEN ** IN DIESEM BUCH FINDEN SIE GRUNDLEGENDE KONZEPTE, DIE IN VERSCHIEDENEN KONTEXTEN ANGEWENDET WERDEN KÖNNEN. VIEL SPAß AUF DER REISE!**

Wolfram Müller

You are reading a very special book! It is mainly created by a large language model (in this version chatGPT3.5turbo with additional Input s. <https://DolphinGPT.ai>).

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Together we have over 70 years of experience in CCPM and over 60 implementations.

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If you want to know more about CCPM and how to implement it successfully, please feel free to contact one of us.

Special thanks to Ken Tyler! He had the idea to build an AI chatbot for #TheoryOfConstraints, #Agile and #Lean - i.e. our <https://DolphinGPT.ai>. This chatbot was the trigger to have this book written by AI. So 1000 times thanks to Ken!

I Introduction

In today's fast-paced and demanding world, organizations often find themselves struggling to deliver projects on time and increase their overall throughput. This constant struggle not only affects the success of the projects but also takes a toll on the people involved. The frustration and stress that come with consistently falling behind schedule and failing to meet targets can be overwhelming.

That is why this book, "The Executive Guide to Breakthrough Project Management," is so important. It aims to bring back the fun and excitement to work by providing a comprehensive learning guide for both learners and our customers. We believe that by implementing the principles and techniques outlined in this book, organizations can break free from the cycle of poor project performance and create a more productive and fulfilling work environment.

As a critical chain multi-project management expert, I have witnessed firsthand the impact that inefficient project management practices can have on individuals and organizations. It is disheartening to see talented and dedicated professionals struggle to meet deadlines and achieve their goals due to outdated and ineffective processes.

Through this book, we aim to provide a solution to this problem. By introducing the concept of critical chain multi-project management, we offer a new and innovative approach to project management that focuses on improving performance, reducing risk, and increasing efficiency. This approach has been proven to be effective in various industries and has the potential to revolutionize the way projects are managed.

We understand that change can be challenging, especially when it comes to implementing new methodologies and practices. However, we firmly believe that the benefits of adopting critical chain multi-project management far outweigh the initial difficulties. By embracing this approach, organizations can not only deliver projects on time but also increase their overall throughput, leading to higher customer satisfaction and improved financial performance.

In conclusion, the time for change is now. We cannot continue to tolerate the struggles and frustrations that come with poor project performance. This book serves as a guide to help organizations break free from these limitations and achieve breakthrough project management. By implementing the principles and techniques outlined in this book, we can bring back the fun to work and create a more productive and fulfilling environment for all.

The book is structured into three parts, each focusing on different aspects of project management. In Part 1, the introduction, the author explores why organizations struggle to achieve a state of flow and outlines the underlying problems that hinder productivity. This section serves as a starting point for readers to understand the challenges they may face and provides insights on how to overcome them.

Moving on to Part 2, the book offers a practical guide for both customers and beginners to quickly grasp the essential concepts of Critical Chain Project Management (CCPM). This section is designed to be hands-on and provides step-by-step instructions on how to implement CCPM effectively. It serves as a valuable resource for those who are new to CCPM and want to learn the key principles without any unnecessary complexity.

For readers who want to delve deeper into the subject, Part 3 offers "deep dives" into specific aspects of CCPM that can help them excel even further. This section provides a more comprehensive understanding of the method and explores advanced techniques and strategies. It is aimed at individuals who are already familiar with CCPM and want to expand their knowledge and skills.

Throughout the book, the author emphasizes the importance of achieving a state of flow in project management. This state of flow encompasses organizational, psychological, and financial aspects, and the book provides insights and inspiration on how to attain this hyper-productive state. It encourages readers to think creatively and find their own solutions by combining the practical foundation presented in Parts 2 and 3 with the ideas, principles, and values described in Part 1.

Overall, the book offers a comprehensive approach to project management, combining the principles of CCPM with other methodologies such as Kanban and Scrum. It provides a roadmap for organizations to improve their operational flow and ultimately achieve hyper-productivity. Whether you are a business owner, CEO, project manager, or team member, this book offers valuable insights and practical guidance to help you succeed in managing projects more effectively.

| | |
|--|----|
| I Introduction | 4 |
| I1 About Us | 8 |
| I2 The Why? | 9 |
| I3 The Reality in Multi-Project Environments | 10 |
| I4 More Projects in Less Time - Future Picture | 11 |
| I4.1 Local vs. Global Efficiency | 11 |
| I4.2 Management Needs Transparency and Predictability | 12 |
| I4.3 The Miraculous Change in the Appreciation of Constraints | 13 |
| I4.4 Employees Need a Focused and Satisfying Work Environment | 14 |
| I5 What's in it for me? What's in it for us? | 16 |
| I5.1 How to Calculate a Growth Business Case | 17 |
| I5.2 Impact on Culture and Cooperation | 18 |
| A CCPM Cookbook - The Method | 20 |
| A1 WIP and Resource Usage | 21 |
| A1.1 The Vicious Cycle of Work-in-Process | 22 |
| A1.2 How to Identify the Constraint | 23 |
| A1.3 How to Break the WIP Trap - Stagger at the Constraint | 23 |
| A1.4 How to Exploit the Constraint | 25 |
| A2 Good Preparation | 27 |
| A3 Project Planning | 28 |
| A3.1 Estimations and Wrong Assumptions in Classical Project Planning | 29 |
| A3.2 Studenten-Syndrom & Parkinsons Law | 30 |
| A3.3 Plan for the Unforeseen - Project Buffer and Estimates | 30 |
| A3.4 Leadership Principles for Flow | 32 |
| A3.5 Integration or Feeding Buffer | 32 |
| A3.6 Milestones - Good or Bad? | 33 |
| A4 Execution | 35 |
| A4.1 Priorities: Why Do I Need Operational Priorities? | 35 |
| A4.1.1 The Fever Curve in CCPM | 36 |
| A4.1.2 Buffer Index as Operational Priority | 37 |
| A4.2 Strategic and Operational Priority | 39 |
| A4.3 Closed Loop Control Mechanism in CCPM | 39 |
| A4.3.1 Steering Committee | 41 |
| A4.3.2 Pipeline Meeting | 41 |
| A4.3.3 Shop Floor Meeting | 42 |
| A4.3.4 Daily Project Team Meeting | 43 |
| A4.4 Specific CCPM Role Definitions | 43 |
| A4.4.1 Project Manager | 44 |
| A4.4.2 Resource Manager | 46 |

| | |
|--|----|
| A.4.4.3 Task Manager | 47 |
| A.4.4.4 Pipeline Manager | 48 |
| A4.4.5 Top Management | 48 |
| A4.4.6 Full Kit Manager | 49 |
| A4.5 Relay Runner Principle | 50 |
| A4.6 Dashboard | 51 |
| A5 Learning as Fast as Possible..... | 53 |
| A5.1 Stabilize CCPM Methods and Tools | 53 |
| A5.2 FIP - Focused Improvement Process | 54 |
| S CCPM Summary | 56 |
| S1 In a Nutshell" | 57 |
| S2 Success Factors | 59 |
| B Deep Dives..... | 60 |
| B1 Physics of Flow | 61 |
| B1.1 Little's Law | 62 |
| B1.2 Goldratt's Law | 63 |
| B1.3 The Math Behind Estimations | 64 |
| B2 From Bottleneck to Constraint | 66 |
| B2.1 Abstractions of Constraints | 67 |
| B2.2 Where the Constraint Should Be..... | 68 |
| B2.3 Typical Organizations and Their Constraints | 69 |
| B3 Strategic Priority: Business Value Optimization | 71 |
| B4 Excursus: Critical Path and Critical Chain..... | 73 |
| B5 From Buffers and Their Sizing..... | 75 |
| B5.1 The Math Behind Buffer Sizing | 76 |
| B5.2 Buffer Sizing..... | 77 |
| B5.3 Feeding Buffers When Chains Are Equally Long..... | 78 |

I1 About Us

We are a team of experts in project management, specializing in various areas such as TOC, Critical Chain, agile project management, process management, and organizational development. Our goal is to enable performance and agility in organizations by making project management agile and reliable.

Kerstin Zulechner is a long-standing trainer for top managers and the founder of "factro," a WebApp for tasks and projects. She has expertise in project management, innovation, digital strategies, change management, and the development of leadership skills. Kerstin also provides systemic consulting for organizations and offers training, coaching, and moderation services. Additionally, she has knowledge in project management software and collaboration tools.

Wolfram Müller focuses on enhancing multi-project management with bottleneck and buffer management from the Theory of Constraints (TOC), also known as Critical Chain Project Management (CCPM). His approach enables agility on the team and work-package level, while maintaining clear priorities from the project world. This results in an optimal flow of work, agility, and full transparency. Wolfram's goal is to make the knowledge of achieving high-performance in the shortest possible time available to all organizations. He believes that there is powerful knowledge on how to bring systems and people to a state of flow, and he aims to make it accessible and applicable for everyone through DolphinUniverse.

Frank Erbacher, the CEO of CCPM Consulting GmbH, brings 20 years of experience as a technical leader and board member. He specializes in multiproject management (CCPM), project acceleration, and transformation projects. Frank also has expertise in mediation and serves as a mediator in business disputes.

Together, we offer a comprehensive range of services to help organizations achieve their project management goals. Whether it's implementing agile methodologies, optimizing processes, or developing leadership skills, we have the expertise to support organizations in their journey towards performance and agility.

12 The Why?

The DolphinUniverse mission is to provide the knowledge and skills for maximizing throughput and improving workplace culture to as many companies and organizations as possible. We empower users to apply advanced management concepts like "Theory of Constraints" and "Self-Organization" to their organizations, projects, and products. Our goal is to make the application of these concepts easy for all and to actively support organizations that do good.

DolphinUniverse is a worldwide community of management consultants, experienced managers, users, and tool suppliers, all known as dolphins. We share a passion for optimizing throughput and continuously improving the ideas and products of DolphinUniverse. Our community thrives on exchanging knowledge, ideas, and cooperation between its members. WhiteDolphins, who are independent entrepreneurs, extend DolphinUniverse by adding their own value and creating product extensions while maintaining their brand and customers.

Our mission is to nourish the DolphinUniverse community and let it grow sustainably. The growth of the community directly impacts its impact. We aim to provide knowledge and support to users at a reasonable cost, while supporters and suppliers earn their share based on their investment in projects. We strive to minimize the effort, cost, and time required for the DolphinUniverse transformation and invest heavily in quality assurance to ensure a successful transformation.

Ethics and values are essential to DolphinUniverse. Our purpose is not to maximize profit, but rather to ensure that all supporters and dolphins can earn a good livelihood. We refuse to support organizations that violate sustainability, human rights, or engage in military activities. We believe in open knowledge and make everything generated in the name of DolphinUniverse available to everyone using the Creative Commons BY-SA licenses.

The methodological core of DolphinUniverse is constraint management and self-organization. We focus on identifying and addressing the constraints that limit productivity in an organization. E. Goldratt's Theory of Constraints has been proven over 30 years to achieve substantial productivity gains with minimal investment. We utilize blueprints developed by the Theory of Constraints for different corporate situations, such as Critical Chain Project Management for project organizations and Drum-Buffer-Rope for productions.

Self-organization, as defined by H. Haken and G. Schiepek, is the key to fast and sustainable processes. It has been known for over 50 years and has transitioned into change management in recent years. The idea is to introduce self-reinforcing processes that set profound change in motion, allowing the organization to master the change on its own. Self-organization focuses on adapting the control system rather than adapting the human being, reducing the inflow of orders or projects and providing a signal for everyone to align their decisions with the whole easily.

13 The Reality in Multi-Project Environments

In today's multi-project environments, many organizations struggle to deliver projects on time and meet all three conditions of the magic triangle of project management. Lead times for projects are getting longer and longer, causing companies to struggle to increase throughput and meet their goals. Unfortunately, this not only affects the success of projects, but also has negative consequences for the people involved and the overall transparency and focus of management.

One of the main problems in these environments is the matrix organization structure. This structure creates conflicts between the projects and the tasks of the line organization. As a result, there is a constant battle for employees as a resource, even between different projects. In this system, whoever shouts the loudest within the company gets the resource, leading to undesirable effects.

Instead of optimizing the entire system of the organization, only parts of it, such as Project A or Project B, are prioritized. This local optimization approach neglects the overall well-being of the organization. Additionally, the constant interruption of employees' work due to multitasking leads to a significant increase in overall set-up times. This harmful multitasking not only affects concentration and leads to more errors, but also results in poorer quality and expensive and time-consuming rework.

As a consequence, the lead times of all projects and tasks are significantly extended. This has a direct impact on the time to market for products or services, causing a delay in generating revenues. The longer the lead times, the later the revenues flow, resulting in negative economic effects for the company.

In order to address these challenges, organizations need to rethink their project management approach. It is crucial to prioritize the overall well-being of the organization and optimize the entire system, rather than focusing solely on individual projects or departments. By minimizing multitasking and reducing conflicts between projects and the line organization, companies can improve transparency, focus, and ultimately deliver projects on time and meet their goals. This will not only have a positive impact on the organization's success, but also create a better working environment for employees.

14 More Projects in Less Time- Future Picture

In today's competitive business landscape, speed is the trump card that can give companies an edge. By implementing Critical Chain Project Management (CCPM), organizations can reduce the lead time of their projects, resulting in faster time to market and increased revenues. This, in turn, leads to improved bottom line results and a stronger position in the market.

The benefits of implementing CCPM are not limited to development projects. In all types of organizational projects, the advantages of reduced lead time become visible earlier. This means that companies can start reaping the benefits of their projects sooner, whether it be increased efficiency, cost savings, or improved customer satisfaction.

One of the key advantages of bottleneck-oriented multi-project management, which is a core principle of CCPM, is the overall increase in company performance. By identifying and addressing bottlenecks in the project pipeline, organizations can optimize their resources and achieve higher project throughput without the need for additional resources. This translates into a significant boost in profitability, as labor costs are one of the main components of operating costs.

In today's competitive landscape, finding and retaining well-trained employees has become increasingly challenging. By implementing CCPM, organizations can utilize their employees' skills more effectively, providing them with a satisfying work environment. This not only improves employee satisfaction and retention but also becomes a strategic factor in global competition.

The key to understanding why CCPM enables organizations to handle more projects in the same amount of time with the same team lies in the inefficiency of specialists when they are required to multitask. Studies have shown that mental workers are only 50% efficient when they have to juggle multiple tasks simultaneously. By eliminating negative multitasking and focusing on one task at a time, CCPM allows specialists to work at their highest level of efficiency, resulting in faster project completion and improved overall productivity.

In conclusion, implementing CCPM offers organizations a future picture of increased competitiveness, faster time to market, and improved profitability. By reducing lead time, organizations can start reaping the benefits of their projects earlier, leading to improved bottom line results. Additionally, bottleneck-oriented multi-project management improves overall company performance and provides a more satisfying work environment for employees. By eliminating negative multitasking, CCPM allows specialists to work at their highest level of efficiency, resulting in faster project completion and increased productivity. In today's fast-paced business world, CCPM is the key to achieving more projects in less time.

14.1 Local vs. Global Efficiency

In the traditional paradigm, the focus was on cost efficiency and optimizing sub-systems. The belief was that if each individual part of the system was optimized, the overall system would improve. However, the Theory of Constraints (TOC) paradigm challenges this notion. It argues that in order to optimize the system, you must sub-optimize the parts. This means that local efficiencies, such as cost efficiency in a department, do not necessarily lead to the success of the overall system.

The reason for this is that local optimizations often lead to wasted capacity and investments that do not align with the needs of the market. When employees are measured and incentivized based on the amount of output they produce, they will focus on producing as much as possible within their department, even if it is not the most urgent or necessary task. This leads to a high level of efficiency within each department, but it does not improve the flow of the entire production process.

The key to understanding why local efficiency reduces the global effectiveness of the organization lies in the concept of throughput. Throughput is focused on the profit and loss statements and does not allow costs to be deferred onto the balance sheet in the form of inventory. This concept needs to be properly explained and demonstrated, as it leads to enhanced sales, throughput, and profitability.

To achieve good financial performance, it is important to have correct operational performance measures in place. These measures should align and be properly subordinated to improving total operational performance. Allowing local metrics to be independently enforced and become dominant leads to a negative spiral where the focus is on cost reduction rather than making more money. This traps businesses within a negative feedback loop and hinders their ability to thrive.

In order to break free from this cycle, organizations need to shift their thinking to what is known as "Throughput World Thinking." This means focusing on the flow of work and the success of the overall system, rather than trying to improve everything at once. By spreading management time, attention, resources, and money across all improvements, organizations delay progress and hinder their ability to make more money.

The utilization paradox is another important aspect to consider. While it may seem logical to strive for 100% utilization of employees, machines, and resources, this can actually be counterproductive. Standing still or overproducing can lead to wasted capacity and inefficiencies. Instead, the focus should be on optimizing the bottleneck resource, as this is what ultimately determines the speed and success of the overall system.

In conclusion, the shift from local optimization to focusing on the success of the overall system is crucial for organizations to thrive. Local efficiencies do not necessarily lead to global effectiveness, and metrics should be aligned with the goals of the entire system. By understanding the concept of throughput and adopting a Throughput World Thinking mindset, organizations can break free from the negative feedback loop and achieve true success.

14.2 Management Needs Transparency and Predictability

Critical Chain Multi-Project Management (CCPM) is a powerful approach that promotes transparency and predictability in project and portfolio management. At the project level, CCPM introduces the concept of the critical chain, which extends beyond the critical path by considering resource availability. This ensures that projects are not delayed due to resource constraints, leading to improved project performance.

One of the key benefits of CCPM is the transparency it creates at both the project and portfolio level. By identifying the critical chain and resource dependencies, CCPM provides a clear view of project progress and potential bottlenecks. This transparency allows project managers to proactively address issues and make informed decisions to keep projects on track.

Moreover, the transparency achieved through CCPM also extends to corporate control. By uncovering weaknesses in company processes, CCPM enables organizations to identify areas for improvement. This insight can then be used to implement targeted continuous improvement measures, resulting in a significant boost to the company's overall performance.

In addition to transparency, CCPM also brings predictability to project management. By considering resource availability and constraints, CCPM provides a more accurate estimation of project timelines. This allows project managers to set realistic deadlines and manage stakeholder expectations effectively.

The predictability created by CCPM offers several benefits. Firstly, it helps in better resource allocation and utilization, ensuring that resources are optimally utilized across projects. This leads to

improved efficiency and productivity within the organization. Secondly, predictability allows for better planning and scheduling, reducing the likelihood of project delays and cost overruns. This enhances customer satisfaction and strengthens the organization's reputation.

In summary, CCPM is a valuable approach that promotes transparency and predictability in project and portfolio management. By considering the critical chain and resource availability, CCPM provides a clear view of project progress and potential bottlenecks. This transparency not only helps in project control but also enables organizations to identify and address weaknesses in company processes. Additionally, CCPM brings predictability to project management, allowing for better resource allocation, planning, and scheduling. The benefits of transparency and predictability created by CCPM contribute to improved project performance and overall organizational success.

14.3 The Miraculous Change in the Appreciation of Constraints

In the world of management, constraints have often been seen as obstacles that hinder the progress of an organization. The common paradigm has been to identify and remove constraints in order to achieve optimal performance. However, the appreciation of constraints has undergone a miraculous change in recent years, thanks to the insights of Eliyahu M. Goldratt and his Theory of Constraints.

Goldratt's revolutionary idea was that constraints are not necessarily negative, but rather the most cybernetically effective control points of complex systems. He argued that constraints are the precious areas of an organization that need protection and careful management. Instead of trying to eliminate constraints, Goldratt proposed that they should be identified and optimized to achieve maximum performance.

The Theory of Constraints introduced the concept of the Five Focusing Steps, which provide a systematic approach to improving a system by addressing its constraints. The first step is to identify the constraint, which is the bottleneck or limiting factor that is impeding the system's performance. Once the constraint is identified, the next step is to exploit it by using it optimally and ensuring that it is never overloaded.

The third step is to subordinate all other management decisions to the constraint. This means that all other activities and processes should be aligned and synchronized with the constraint to ensure smooth flow and optimal utilization of resources. The fourth step is to elevate the constraint by finding ways to increase its capacity or remove any barriers that are limiting its performance. Finally, the fifth step is to repeat the process by identifying the next constraint and starting the improvement cycle again.

One of the key insights of the Theory of Constraints is that the constraint is the key to answering the question of when the organization can start the next project. By understanding the capacity of the constraint and aligning the project start accordingly, the organization can ensure that work flows smoothly and projects are completed on time.

Furthermore, improvement measures are extraordinarily effective when applied to the constraint. By focusing on improving the performance of the constraint, the organization can achieve significant gains in overall system performance. This is because any improvement made to the constraint directly impacts the entire system, leading to increased throughput and efficiency.

As a critical chain multi-project management expert, I have witnessed firsthand the power of the Theory of Constraints in transforming organizations. By embracing constraints and using them as the catalyst for continuous improvement, organizations can achieve remarkable results. The shift in mindset from viewing constraints as obstacles to appreciating them as valuable control points has

revolutionized the way we approach management and has paved the way for a new era of performance optimization.

14.4 Employees Need a Focused and Satisfying Work Environment

In order for employees to thrive and be productive in their work environment, it is crucial to provide them with a clear and focused sequence of tasks. Without this clarity, it becomes nearly impossible for employees to maintain a sense of focus and concentration. Switch-tasking, or constantly shifting between tasks, starts with the way employees think about their work. By encouraging employees to maintain clear priorities within their minds, the entire company can work in a more organized and efficient manner.

Disturbances and interruptions can greatly hinder productivity. To address this, it is important for resource managers to investigate these disturbances using tally sheets and make the findings transparent for employees. By identifying the root causes of disruptions, steps can be taken to minimize or eliminate them, allowing employees to work without unnecessary interruptions. One effective strategy is to only take action on emails that are directly addressed to the individual, reducing the time spent on irrelevant messages.

Managers play a crucial role in ensuring that employees only begin new tasks when the relevant parts and information are ready, and the previous tasks are complete. This helps to maintain a sense of discipline and focus among employees. Additionally, introducing stand-up meeting areas and a focus forum in the manufacturing hall can provide designated spaces for employees to collaborate and discuss their work. By hanging monitors and displaying the project sequence and work in progress for all to see, transparency is promoted, and everyone can stay informed about the progress of various tasks.

It is important for everyone in the organization to be aware of who the central defenders are at any given time. This ensures that employees know who to reach out to for assistance or guidance when needed. Providing special phone numbers to redirect any inquiries to the central defenders can help streamline communication and prevent unnecessary disruptions. Furthermore, it is crucial to pay attention to the work in progress and avoid overcrowding the system with too many tasks. By training employees in key positions to work in a focused manner, their efficiency can be increased, leading to better overall results.

While work is a significant part of employees' lives, it is important to recognize that personal issues such as family, health, and hobbies also require attention. Balancing personal and work-related matters is essential for employees to maintain a sense of well-being and satisfaction. From an organizational perspective, it is important to utilize the limited attention of all management effectively, without overwhelming individuals and causing mistakes or delays in critical decisions.

Encouraging ideas from employees and executives is crucial for fostering innovation and growth within the organization. Even if some ideas are ultimately rejected, it is important to consider them from all angles and take into account the global parameters of the organization. Management attention is a sensitive issue, and it is important to be aware of any signs of managers being under stress due to overload. Actively addressing these issues is critical for the smooth and safe progress of the organization.

By creating a focused and satisfying work environment, employees can thrive and excel in their roles. Clarity of task prioritization, reducing negative multitasking, and providing the necessary resources and support are key factors in achieving this. When employees feel supported and engaged, the quality of their work improves, and they become more emotionally invested in their tasks. Ultimately,

a focused and satisfying work environment leads to increased productivity, employee satisfaction, and overall success for the organization.

15 What's in it for me? What's in it for us?

CCPM offers numerous benefits for me as an individual. Firstly, it allows me to experience a state of flow in my work. By focusing on the critical chain and eliminating unnecessary tasks, I can work more efficiently and effectively. This not only increases my productivity but also gives me the time and space to be creative and deliver high-quality work. The satisfaction that comes from being able to fully immerse myself in my tasks is invaluable.

Additionally, CCPM ensures that everyone in the organization has the same priority. This means that I have a clear understanding of where my skills and experience can be most valuable in improving the overall performance of the group. This sense of purpose and contribution fosters a sense of harmony among employees and creates a collaborative environment where we can all thrive.

Furthermore, CCPM provides me with more time for personal growth and development. With the elimination of unnecessary tasks and a focus on the critical chain, I have the opportunity to engage in self-learning, exchange knowledge with my peers, and continuously improve my skills. This not only enhances my professional capabilities but also allows me to excel in my role and contribute even more to the success of the organization.

In addition to personal growth, CCPM also offers the prospect of long-term security. By implementing a stable and sustainable project management approach, the organization becomes more resilient to external factors and better equipped to navigate challenges. This provides me with a sense of stability and confidence in the future, knowing that the company is well-positioned for success.

Lastly, CCPM brings about a positive change in the management style. Micromanagement is replaced with a greater level of trust and responsibility. This shift allows me to take on new and exciting challenges, as I am given more autonomy and the opportunity to work on tasks that are within my field of expertise. This not only enhances my job satisfaction but also allows me to contribute to the organization in a more meaningful way.

In summary, CCPM offers a range of benefits for me as an individual. From experiencing a state of flow in my work to having a clear understanding of my role in improving the group's performance, CCPM provides me with the opportunity to grow both personally and professionally. Additionally, the stability and long-term security it brings, along with the elimination of micromanagement, create a positive and fulfilling work environment. By embracing CCPM, I can confidently say that there is a lot in it for me and for all.

Implementing Critical Chain Project Management (CCPM) in an organization offers numerous benefits, both for the organization as a whole and for individuals within it. By adopting CCPM, organizations can achieve a smoother flow of work, allowing them to focus on the most important tasks and projects. This increased focus on priority work leads to shorter lead times, enabling products and services to reach the market faster. As a result, organizations can experience better returns on their investments.

Furthermore, CCPM promotes higher throughput, which in turn fosters innovation and enhances the organization's fitness for the future. With more projects being completed efficiently, the organization gains the capacity to clean up existing processes, build platforms, and improve overall architecture. This shift from engineering to order to configure to order allows for greater adaptability and flexibility in meeting customer demands.

Ultimately, the successful implementation of CCPM results in a sustainable and growing organization. This growth provides security for all employees, as it ensures the stability and longevity of the

organization. By optimizing project management and achieving higher throughput, the organization can create a stable and secure environment for its workforce.

From an individual perspective, supporting CCPM can also be highly beneficial. By streamlining project management processes and reducing lead times, individuals can experience a more efficient and effective work environment. Shorter lead times mean that individuals can see the results of their efforts sooner, leading to a sense of accomplishment and motivation. Additionally, the increased throughput allows individuals to take on more challenging and innovative projects, fostering personal and professional growth.

In summary, embracing CCPM offers organizations the opportunity to achieve a smoother flow of work, shorter lead times, increased throughput, and ultimately, sustainable growth. This growth provides security for all employees and creates a conducive environment for personal and professional development. By supporting CCPM, both organizations and individuals can reap the benefits of improved project management and increased productivity.

15.1 How to Calculate a Growth Business Case

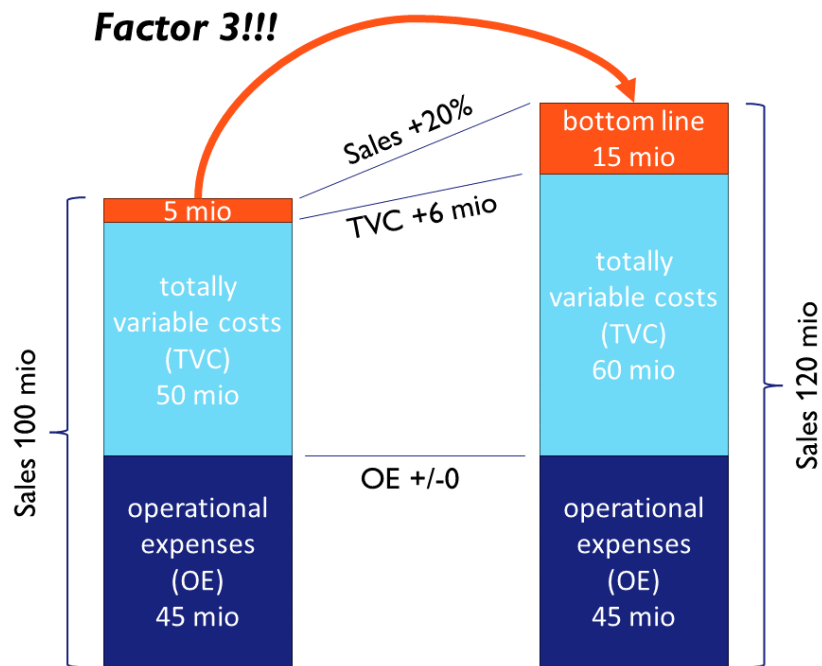
Calculating a growth business case is essential for any company looking to achieve success and increase their bottom line. It is important to note that business cases focused solely on reducing costs are not motivating for anyone involved. Instead, what truly captures the interest of both the company and individuals is a business case that focuses on growth. This type of business case is built upon the idea of increasing throughput, which refers to the output and sales of the company, without a significant increase in operational expenses. The direct result of this is an increase in the bottom line.

To calculate the bottom line increase, we need to understand the formula. The bottom line is calculated by subtracting the total variable costs and operational expenses from the sales. Therefore, the bottom line increase can be calculated by multiplying the current sales with the expected throughput increase and subtracting the current total variable costs. It is important to note that the bottom line increase can be significantly higher than the current bottom line, as even a small increase in sales can have a substantial impact on the bottom line.

One important factor to consider is the time to market. Companies that have a shorter time to market often have the advantage of being able to command higher prices for their products or services. Additionally, a shorter time to market allows for shorter learning cycles and increased agility. These factors contribute to even better bottom line results.

As a critical chain multi-project management expert, I understand the importance of calculating a growth business case. It is crucial to focus on increasing throughput and sales while keeping operational expenses in check. By doing so, companies can achieve significant growth and improve their bottom line. It is important to remember that business cases focused on reducing costs alone are not motivating. Instead, a business case that focuses on growth and increasing the bottom line is much more compelling and beneficial for all parties involved.

In conclusion, calculating a growth business case requires a focus on increasing throughput and sales while minimizing operational expenses. This approach leads to a significant increase in the bottom line, as even small increases in sales can have a substantial impact. Additionally, companies with a shorter time to market can command higher prices and benefit from shorter learning cycles and increased agility. By understanding and implementing these principles, companies can achieve remarkable growth and success.



The picture shows a typical growth business case - as an example of a mechatronic company

In the world of mechatronic products, there is a company that has been producing and selling its products with a sales figure of 100 million dollars. However, like any business, they have to consider the costs associated with their sales. In this case, the totally variable costs amount to 50% of the sales, which is equivalent to 50 million dollars. Additionally, they have operational expenses of 45 million dollars. Taking all these factors into account, the company's bottom line revenue currently stands at 5 million dollars.

Now, imagine the possibilities if this company were to implement Critical Chain Project Management (CCPM). By applying CCPM, they can increase their output by an impressive 50%. However, it's important to note that not all of this increased output can be sold in the market. So, let's assume that 20% of the increased output can be sold, resulting in additional sales of 20 million dollars.

When we calculate the new figures of profitability, we subtract the totally variable costs of 60 million dollars (50% of the increased sales) and the unchanged operational expenses of 45 million dollars. This leads us to a new bottom line revenue of 15 million dollars.

Comparing the before and after figures, we can clearly see the impact of applying CCPM. The company's bottom line revenue has tripled, going from 5 million dollars to 15 million dollars. This significant increase in profitability is a testament to the power of CCPM and its ability to optimize project management and increase sales.

By implementing CCPM, this mechatronic company has not only increased their output but also their bottom line revenue. The additional sales generated from the increased output have far outweighed the costs associated with production and operations. This success story serves as a reminder of the potential benefits that can be achieved through the adoption of effective project management methodologies like CCPM.

15.2 Impact on Culture and Cooperation

The deepest character of humans is rooted in our innate ability to cooperate. It is ingrained in our very DNA, as the human genome is built for collaboration. We possess special "mirror neurons" that enable us to empathize and feel what others are experiencing. This powerful mechanism drives us to

work together, not only to benefit ourselves but also to foster growth as individuals and as a collective.

In the realm of project management, the Critical Chain Multi Project Management (CCPM) approach plays a crucial role in harnessing and nurturing this cooperative nature. By providing a clear focus on what is urgent and important, CCPM allows individuals to contribute their skills and expertise to help others. This creates a culture of cooperation, where team members actively support and assist one another in achieving shared goals.

Moreover, CCPM enables individuals to be themselves and grow as individuals within the context of a larger team. It recognizes that each person has unique talents and strengths that can contribute to the overall success of the project. By embracing individuality and encouraging personal growth, CCPM fosters an environment where team members can thrive and reach their full potential.

Being part of a harmonious and sustainable group is a deeply fulfilling experience. It allows individuals to tap into the power of collective intelligence and achieve outcomes that surpass what they could accomplish alone. In this context, cooperation becomes not just a means to an end, but a deeply embedded value that drives the team forward.

In the pursuit of a common goal, individuals can find a sense of purpose and fulfillment. They can contribute their unique perspectives and skills, knowing that their efforts are part of something greater than themselves. This sense of belonging and shared purpose creates a strong bond within the team, fostering trust, collaboration, and a deep sense of camaraderie.

In conclusion, the impact of culture and cooperation in project management cannot be overstated. The human genome is wired for collaboration, and CCPM provides a framework that nurtures and harnesses this innate characteristic. By embracing individuality, fostering cooperation, and working towards a common goal, teams can create a harmonious and fulfilling environment where individuals can grow and thrive. In this way, culture and cooperation become the driving forces behind successful project outcomes and the personal development of team members.

A CCPM Cookbook- The Method

In the previous chapter, we discussed the importance of Critical Chain Project Management (CCPM) and its ability to deliver step change project performance improvement. Now, in this chapter, we will delve into the basics of the CCPM method itself. As a critical chain multi project management expert, it is crucial to have a deep understanding of the key principles and techniques that make CCPM so effective.

CCPM involves much more than simply aggregating safety time. It is a structured method for managing projects that consistently delivers significant and rapid improvement across a wide range of project environments. The three core principles of CCPM form the foundation of this method.

The first principle of CCPM is to plan and manage your project using CCPM. This involves using the critical chain, which is the longest sequence of dependent tasks in the project, as the basis for scheduling and resource allocation. By focusing on the critical chain, you can identify and manage the constraints that are most likely to impact project completion.

The second principle of CCPM is to select and contract with your most important project contractors/suppliers using a Project Alliance. This collaborative contracting approach aligns the interests of all team members and promotes better performance at a lower cost. By forming a Project Alliance, you can leverage the professional expertise of contractors and suppliers to achieve more than just following instructions.

The third principle of CCPM is to use the power of agile methods at the team level to make your portfolio and project management more agile. This involves combining CCPM with agile concepts to effectively manage multiple teams and projects. By adopting agile practices, you can enhance collaboration, adaptability, and efficiency in your project management approach.

Understanding and applying these principles is essential for successfully implementing CCPM in your project management practices. By embracing the basics of the CCPM method, you can unlock its full potential and achieve faster project delivery, lower costs, and greater predictability.

In the upcoming chapters, we will explore the various techniques and strategies that can be employed within the CCPM framework to optimize project performance. From managing project execution to leveraging the expertise of contractors and suppliers, we will provide practical insights and examples to guide you on your CCPM journey.

Stay tuned as we dive deeper into the CCPM Cook Book and uncover the secrets to breakthrough project management using this powerful methodology.

A1 WIP and Resource Usage

In the world of project management, Work-in-Progress (WIP) refers to the number of projects or tasks that are currently in progress within an organization. It represents the amount of work that has been started but not yet completed. Understanding the relationship between WIP and resource usage is crucial for effective project management and achieving optimal results.

One important aspect to consider is the relationship between WIP and lead time, which is the time it takes for a project to be completed from start to finish. According to Little's Law, there is a direct correlation between WIP and lead time. The more work that is in progress, the longer it will take to complete each individual project. This is because resources are spread thin and cannot be fully dedicated to any one task, leading to delays and inefficiencies.

Similarly, the relationship between WIP and throughput in the constraint is significant. The constraint refers to the bottleneck or the limiting factor that determines the overall performance of the project. When there is excessive WIP, resources are stretched thin, and the constraint is unable to operate at its maximum capacity. This results in reduced throughput and overall project delays.

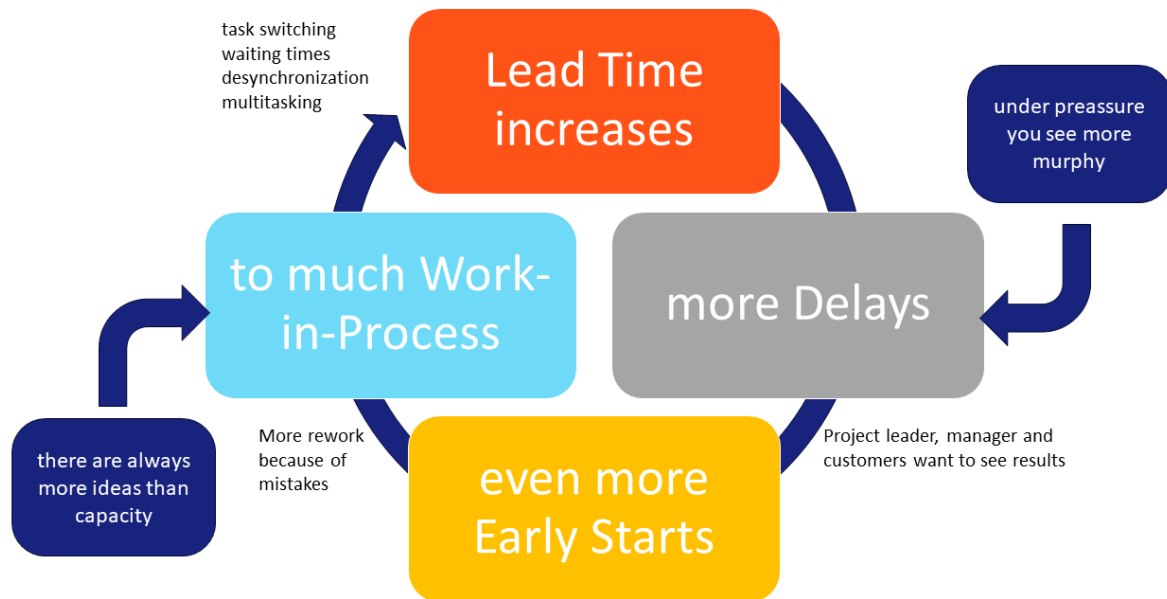
So why do most companies have too much WIP? One reason is the belief that starting a project as soon as possible is beneficial. The common notion is that the sooner a project is initiated, the better. However, this mindset often leads to a vicious cycle. As more projects are started, the WIP in the system increases, causing lead times to lengthen. Additionally, starting projects without all the necessary information leads to idle time and multitasking, further hindering progress. Moreover, the ease of accommodating change requests when there appears to be ample time can also contribute to excessive WIP.

To address this challenge, organizations can employ a Pipeline Manager who monitors the WIP and suggests when to start new projects. The Pipeline Manager follows the principle of "first finish, then start something new." By staggering the start of new projects in a way that ensures the WIP in the constraint never exceeds its capacity, the Pipeline Manager helps maintain a manageable workload and prevents the negative consequences of excessive WIP.

The effects of too much WIP on staff members should not be underestimated. When resources are spread thin across multiple projects, employees become demotivated and overwhelmed. The lack of throughput and the inability to see tangible results can lead to decreased productivity and job dissatisfaction. Additionally, reporting and meetings tend to increase, consuming more time and further straining resources.

In conclusion, managing WIP and resource usage is crucial for successful project management. Understanding the relationship between WIP and lead time, as well as the impact on the constraint and staff members, allows organizations to optimize their project workflows. By implementing strategies such as the role of a Pipeline Manager and adhering to the principle of "first finish, then start something new," companies can minimize the negative effects of excessive WIP and achieve better project outcomes.

A1.1 The Vicious Cycle of Work-in-Process



The vicious cycle of Work-In-Process (WIP)

In the world of multi-project management, the concept of Work in Progress (WIP) plays a crucial role. However, it is often overlooked and underestimated, leading to a vicious circle of negative consequences. This circle begins when companies take on as many projects as possible, driven by high market demand and the assumption of infinite resources. Unconsciously, management fails to recognize the impact this has on WIP.

As the number of projects increases, so does the WIP in the company. This, in turn, leads to longer lead times for projects, as resources become stretched thin. Promised deadlines become increasingly difficult to meet, and delays become a common occurrence. In an attempt to mitigate these delays, management resorts to starting projects as early as possible, even if they are not adequately prepared. However, this approach only exacerbates the problem.

The early start of poorly prepared projects has detrimental side effects. Errors increase, and there are waiting times and desynchronization between different project parts. The entire organization becomes burdened with the weight of these poorly managed projects, making it difficult to maintain order and efficiency. In an effort to regain control, management resorts to prioritizing projects. However, this prioritization is constantly changing due to customer complaints about delays and poor quality.

The increasing instability of the working conditions takes a toll on the employees. They find themselves caught in a state of negative multitasking, where their attention and concentration are divided among multiple tasks. This leads to a significant decrease in efficiency and productivity. Unfortunately, the influx of new projects continues unabated, further increasing the WIP and closing the second vicious circle.

To break free from this cycle, it is crucial to recognize the importance of limiting WIP. By keeping a certain minimum amount of work items in progress and controlling the release of new work items based on completed ones, the focus and concentration of resources can be improved. This approach reduces multitasking and allows employees to dedicate their attention to the current request or project task at hand.

Additionally, implementing a scheme of priorities can help identify projects or missions that are stuck and need attention. By addressing these bottlenecks, the flow of work can be improved, and delays can be minimized. It is important to remember that increasing WIP indefinitely is not a sustainable solution. There comes a point where the additional workload becomes unsustainable, and attempts to increase throughput by increasing WIP limits will only lead to further thrashing of the system.

In conclusion, the management of Work in Progress is a critical aspect of multi-project management. Ignoring its impact can lead to a vicious circle of negative consequences, including increased lead times, delays, and poor quality. By implementing strategies to limit WIP and prioritize projects effectively, organizations can break free from this cycle and achieve better control and efficiency in their project management processes.

A1.2 How to Identify the Constraint

To identify the constraint or bottleneck in a multi-project environment, you can follow a simple recipe that requires little effort. Start by creating an Excel spreadsheet with an x-y matrix. On the y-axis, list all the project names, and on the x-axis, list all the departments that could potentially be considered as a bottleneck.

Next, roughly estimate the effort in hours that each department contributes to each project. Then, calculate the sum of the efforts of each department across all projects.

To determine the utilization time of each department, divide the effort total by the number of available employees in that department. Finally, divide this result by the number of weekly working hours to estimate the number of weeks that the department is working at full capacity.

Identify the department with the highest utilization time as the bottleneck. This department is the one that is currently limiting the performance of the system.

Once the bottleneck is identified, stagger all the projects at the bottleneck department. This means adjusting the project schedules to ensure that the workload is evenly distributed and optimized based on the capacity of the bottleneck.

After 1-2 months of implementing these changes, you will gain insights into whether your initial estimates were correct. It is possible that you may need to reassess and set another department as the new bottleneck based on the newly gained insights.

Remember, this process is an ongoing one, and it may require continuous monitoring and adjustment to ensure that the constraint is effectively managed and optimized.

A1.3 How to Break the WIP Trap- Stagger at the Constraint

In a multi-project organization, it is crucial to identify the bottleneck resource, also known as the drum resource. This resource sets the pace for planning the entire project portfolio. To ensure smooth operations and avoid overloading the bottleneck resource, projects are staggered in a way that they do not start simultaneously.

Staggering the projects means introducing a time delay between the start of each project. This allows for a relatively continuous scheduling of the bottleneck resource, ensuring that it is not overwhelmed with multiple projects at the same time. By staggering the projects, we can effectively manage the workload and prevent the bottleneck resource from becoming overloaded.

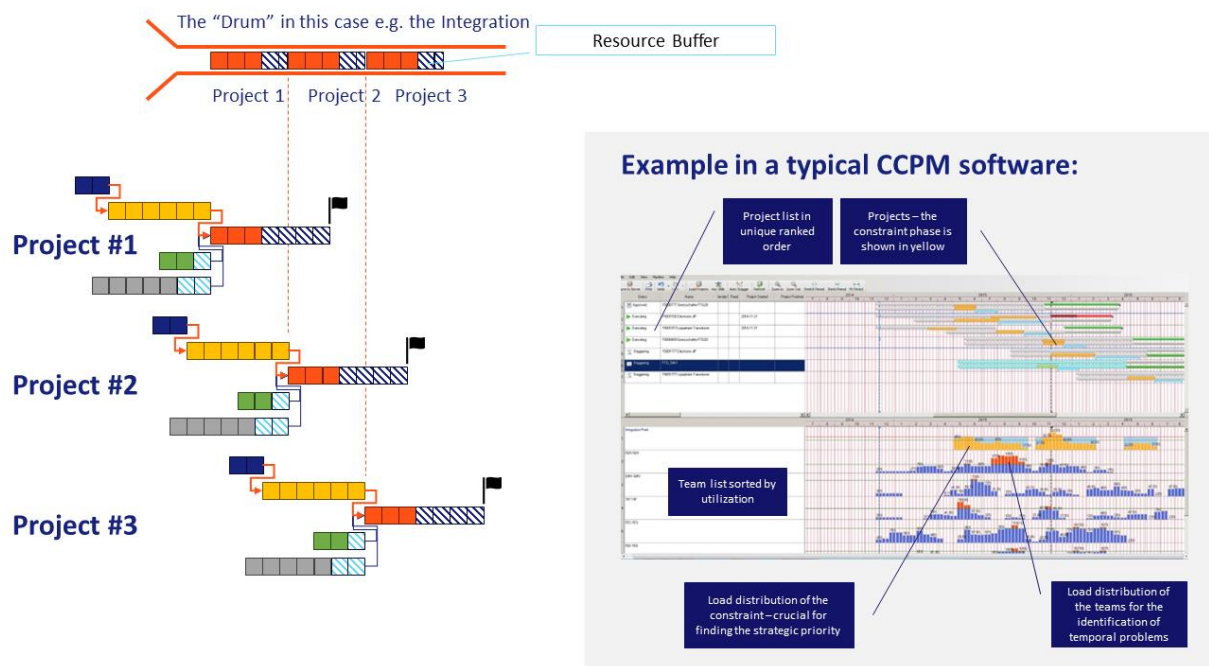
To further support the smooth flow of work, buffers are created in front of the bottleneck resource. These buffers act as a safety net, ensuring that tasks are completed even if the bottleneck resource

encounters any delays or disruptions. This concept is known as drum buffer, where the buffer protects the drum resource from any potential disruptions.

In the context of a multi-project organization, the staggered project portfolio takes precedence over individual projects. The focus is on optimizing the overall flow and throughput of the entire portfolio, rather than solely focusing on individual project timelines. By staggering the projects and managing the workload of the bottleneck resource, we can ensure that the entire project portfolio operates efficiently and effectively.

It is crucial to keep the bottleneck resource free from disruptions. Any disruptions or delays in the bottleneck resource can have a cascading effect on the entire project portfolio. Therefore, it is essential to closely monitor and manage the workload of the bottleneck resource, ensuring that it remains free from any disruptions that could hinder the progress of the projects.

In conclusion, staggering the projects at the bottleneck resource is a key strategy in breaking the work-in-progress trap in a multi-project organization. By identifying the bottleneck resource, managing its workload, and creating buffers to protect it from disruptions, we can optimize the flow and throughput of the entire project portfolio. This approach prioritizes the overall portfolio performance and ensures that the projects are completed efficiently and on time.



Staggering three similar projects at the constraint (red team) and an example of how this looks like in a CCPM software

In a multi-project organization, it is crucial to identify the bottleneck resource, also known as the drum resource. This resource sets the pace for planning the entire project portfolio. The projects within the organization are staggered in such a way that the bottleneck resource is not overloaded with multiple projects at the same time. This ensures that the resource can effectively handle the workload without becoming overwhelmed.

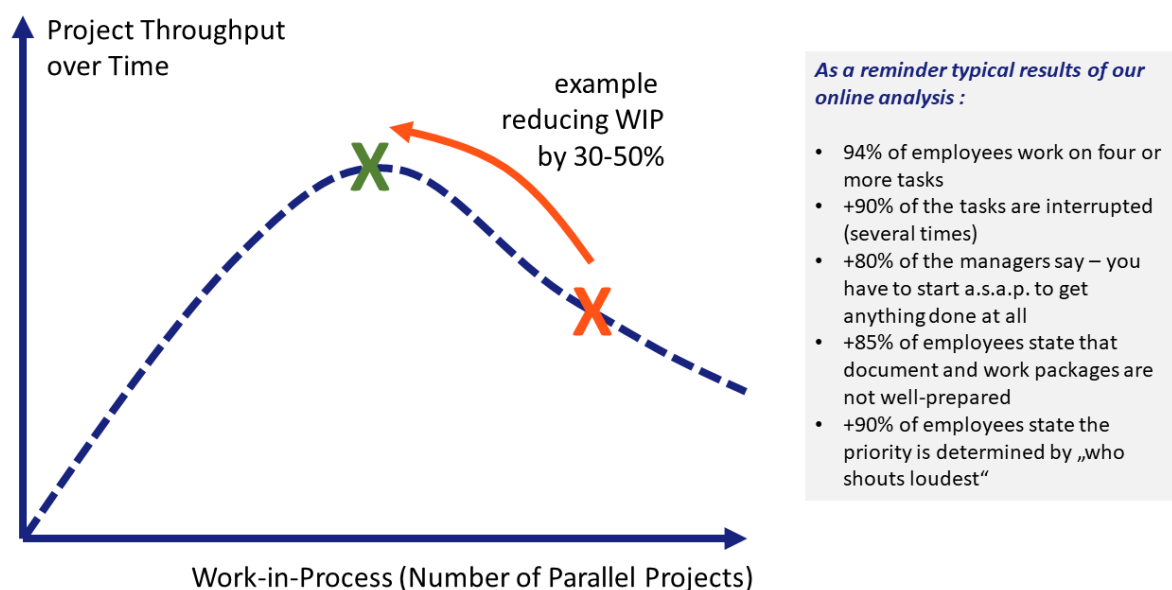
To prevent the bottleneck resource from coming to a standstill, buffers are created in front of it. These buffers act as a contingency reserve, ensuring that tasks are completed even if the bottleneck resource encounters any delays or disruptions. This concept is known as the drum buffer.

The staggered project portfolio takes precedence over individual projects. The focus is on optimizing the overall flow of work rather than prioritizing individual projects. By managing the workload of the

bottleneck resource effectively, the organization can ensure that projects progress smoothly and efficiently.

It is essential to keep the bottleneck resource free from disruptions. This means that any potential issues or obstacles that may impact the resource's productivity should be addressed and resolved promptly. By maintaining a clear and uninterrupted workflow for the bottleneck resource, the organization can maximize its capacity and ensure the successful completion of projects.

In summary, in a multi-project organization, the bottleneck resource plays a crucial role in planning the project portfolio. By staggering projects and implementing buffers, the organization can optimize the workload of the bottleneck resource and ensure that tasks are completed efficiently. It is important to prioritize the overall project portfolio and keep the bottleneck resource free from disruptions to maintain a smooth workflow and achieve project success.



Fewer projects in parallel results in exploiting the constraint in a better way

A1.4 How to Exploit the Constraint

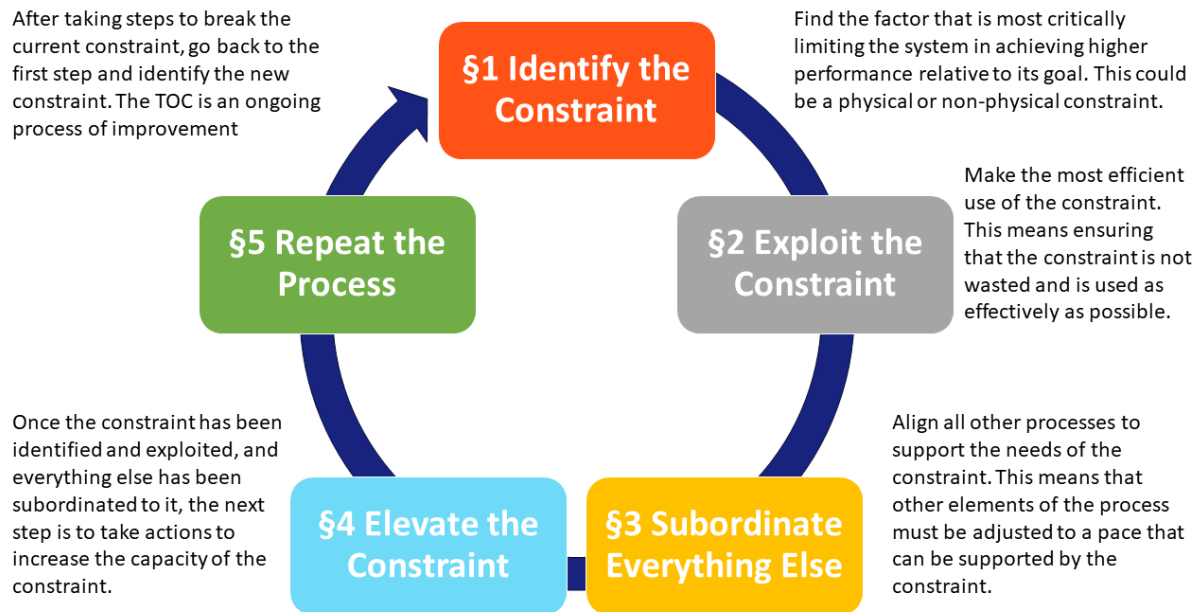
In the world of critical chain multi project management, the process of exploiting the constraint is a crucial step towards maximizing the performance of a system. The first step, as previously mentioned, is to identify the constraint or bottleneck that is limiting the system's performance. Once this constraint has been identified, the focus shifts towards developing and implementing a strategy to exploit it to the maximum.

To effectively exploit the constraint, one strategy is to limit the incoming work in a way that ensures the constraint can operate in optimal conditions. By carefully managing the flow of work, we can prevent overwhelming the constraint and ensure that it can perform at its best. Additionally, it is important to consider the allocation of work that does not directly contribute to the core competence of the bottleneck. By dispatching this work to other departments or resources, we can alleviate the burden on the constraint and allow it to focus on its primary function.

Another key aspect of exploiting the constraint is to optimize the core processes within the bottleneck itself. This involves streamlining and improving the efficiency of the processes to eliminate any unnecessary delays or inefficiencies. It is crucial to ensure that the work for the bottleneck is

always extremely well prepared, with all necessary resources and information readily available. This level of preparation can significantly increase throughput through the bottleneck, often resulting in a 30% or more increase in performance, all while utilizing the same number of employees.

By implementing these strategies, we can effectively exploit the constraint and maximize the system's performance. It is important to remember that exploiting the constraint focuses on the short-term goals of improving throughput and efficiency. However, in the long-term, it is necessary to consider the elevation of the constraint, which involves finding ways to increase its capacity or capability. But for now, the focus is on exploiting the constraint to its fullest potential, utilizing the strategies mentioned above.



Exploit the constraint

Now comes the challenging part of putting the strategy into action. It requires complete alignment and subordination to the developed strategy. This means that the bottleneck, or the constraint, determines how many projects can be active at the same time. Only those projects that have optimized preparations should start in the bottleneck. Implementing this strategy may not always be easy and it requires full support from top management and a patient learning phase. According to Goldratt, throughput can easily exceed 50% as a result of this measure, and our experience shows that it can be 30% or even higher.

Once the strategy has been fully implemented, it is time to expand the bottleneck. However, caution must be exercised here. The bottleneck is usually strategically chosen, and reinforcing it can cause a shift to other areas, which is typically undesirable. Therefore, it is advisable to first expand the non-bottlenecks before tackling the reinforcement of the bottleneck. However, if the bottleneck shifts, it is necessary to start again at step 1 and identify the new constraint. It is crucial to actively prevent inertia from becoming the constraint, as this can hinder progress and performance.

In summary, the key ideas of this approach are to subordinate everything to the developed strategy, elevate the constraint, and prevent inertia from becoming the constraint. Implementation requires full support and alignment from top management, and a patient learning phase may be necessary. Once the strategy is fully implemented, the bottleneck can be expanded, but caution must be exercised to avoid undesirable shifts. By actively preventing inertia, the organization can ensure continuous improvement and optimal performance.

A2 Good Preparation

Starting a project without all the relevant information can have negative consequences. Resources may be forced to begin a project without complete information, only to realize later that they lack the necessary details to continue. This not only adds to the multitasking burden of the resources but also directly contributes to longer lead times, especially if these resources are bottleneck resources. In today's dynamic business environment, it is unrealistic to expect that everything will be clear at the beginning of a project, following a traditional waterfall approach.

To address this challenge, it is crucial for every team or organization to define what relevant information is needed at the start of a project. By identifying the essential details such as the project goal, crucial customer requirements, and technical specifications, the project team and bottleneck resources can work seamlessly without waiting for information that could have been provided earlier. This ensures that the project can adapt to the dynamic nature of the business environment.

A "Full Kit" for a project refers to having all the necessary information and prerequisites in place for the project to start without interruption. This includes having a well-defined plan, the required resources, and the necessary specifications. The concept of a Full Kit is particularly important when considering the critical chain and integration points within a project. By ensuring that all the components of the Full Kit are in place, the project can proceed smoothly and efficiently.

Prioritizing good preparation and having a Full Kit for a project brings several benefits. Firstly, it minimizes disruptions caused by starting a project without complete information, reducing the need for rework or stopping and restarting. This leads to shorter lead times and improved efficiency. Additionally, good preparation optimizes resource utilization, especially at bottleneck points, ensuring that these critical resources are not wasted or overburdened. This aligns with the principles of critical chain multi-project management, which emphasizes the importance of efficient resource allocation.

In conclusion, having all the relevant information and a Full Kit for a project is essential to ensure smooth and efficient project execution. By defining the necessary details at the start of a project and prioritizing good preparation, organizations can minimize disruptions, reduce lead times, optimize resource utilization, and align with critical chain multi-project management principles. This approach allows projects to adapt to the dynamic business environment and achieve successful outcomes.

A3 Project Planning

Despite the dynamic nature of projects, proper planning is still essential. While it may not be necessary to plan every detail a year in advance, including as much information as possible in the planning stage is beneficial. This not only helps to align the project team but also ensures that everyone is on the same page.

To start the planning process, it is important to formulate the project goal in concrete terms and identify partial results. This provides clarity and direction for the project. Additionally, identifying all parties involved and understanding their motivations and stakes in the project is crucial. This can be done through a classical stakeholder analysis, which helps to consider the perspectives and interests of all stakeholders.

Identifying risks, stumbling blocks, and bottleneck factors should also be done during the planning stage. By addressing these challenges early on, the project team can develop strategies to overcome them. This proactive approach ensures that potential obstacles are taken into account from the beginning.

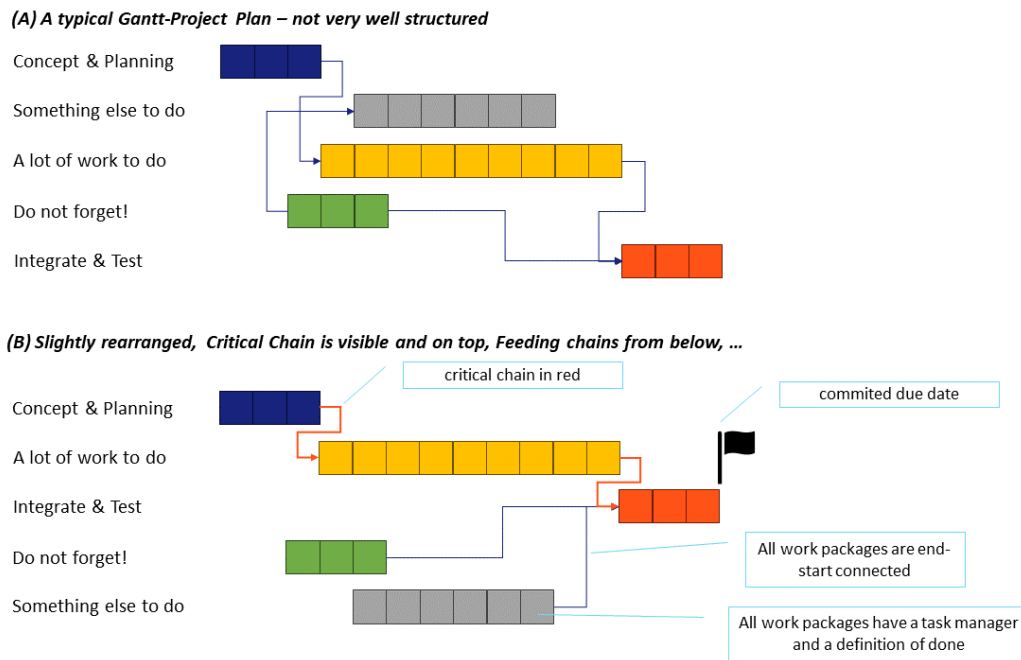
Phase planning is another important element of project planning. By formulating intermediate results as goals for each phase of the project, the team can track progress and maintain focus. This helps to break down the project into manageable chunks and provides structure and control throughout the project lifecycle.

Planning dependencies is also crucial in project management. From the identified requirements, risks, and stumbling blocks, the team can derive work packages and create a work breakdown structure for each phase. By organizing work packages in a logical order and making dependencies clear, the team can develop a Gantt chart. While it is not necessary to plan every detail for the entire project, having clear work packages and dependencies for the first phase or intermediate result is sufficient. The Gantt chart helps to visualize the dependencies and timeline of the project.

In project management, there is a concept called the critical path, which refers to the longest sequence of interdependent tasks within a project. However, in the Theory of Constraints (TOC), we also consider the critical chain. Unlike the critical path, the critical chain takes into account the finite capacity of the resources involved in the project. This means that the work packages in the critical chain may not necessarily be connected by predecessor-successor relationships. The critical chain is the constraint of a single project and determines the duration of the project.

The critical chain is the bottleneck of any project. If there is no progress on the critical chain, the project's completion will be delayed. It is important to prioritize and focus on the critical chain to ensure project success. The critical chain always refers to only one project, and its length is determined by estimations of the duration of the work packages.

In conclusion, proper planning in project management is crucial for success. By including comprehensive information, formulating clear goals, identifying risks and dependencies, and focusing on the critical chain, project teams can ensure that projects are executed efficiently and effectively.



(A) A typical generic unsorted Gantt project plan, (B) same with Critical Chain visible, end-start connections, committed due date, task manager, definition of done

A3.1 Estimations and Wrong Assumptions in Classical Project Planning

The problem lies in the fact that these buffers are not transparently displayed in the project plan. They are hidden within each individual step and phase, adding unnecessary days, weeks, or even months to the overall plan. This not only elongates project durations but also fails to deliver projects on time.

The pressure on employees to be reliable and meet their commitments further increases the buffers on the work package level. Employees tend to provide pessimistic estimates, adding even more safety to their estimations. This leads to estimates that are often close to the 95% absolute probability, which is double the value of the actual estimate.

Another psychological effect that comes into play is Parkinson's law. When someone estimates buffers in their work package, they will do everything possible to achieve precisely this estimate. This means that even if the buffer is unnecessary, they will still strive to use up all the allocated time.

Conventional project management assumes that estimates are sacrosanct and treats them as commitments. However, this is an invalid assumption. Estimates are not accurate calculations but rather the best guess based on experience and assumptions. Treating them as commitments only adds unnecessary pressure and leads to inflated estimates.

The focus on managing each individual work package also leads to a misconception that if every work package is on time, the project will be on time. This is a wrong assumption. The execution management of the project is crucial, not just the planning. Classical project management fails to address this aspect.

In contrast, critical chain multi-project management focuses on reducing wasted time and improving execution speed. Each task includes an allowance of safety time to cover the chance that it will take longer than the average time. However, these safety buffers are not wasted but strategically utilized to ensure efficient project delivery.

In conclusion, estimates are never perfect, and any planning relying on perfect estimates will be unstable. Classical project management's approach of treating estimates as commitments and focusing on individual work packages leads to inflated buffers and delays in project delivery. A shift towards execution management and utilizing safety buffers strategically is necessary for efficient project execution.

A3.2 Studenten-Syndrom & Parkinsons Law

In project management, there are two phenomena that can have a significant impact on the success of a project: the student syndrome and Parkinson's Law. The student syndrome refers to the tendency of individuals to delay starting a task until the last possible moment, often when there is a buffer or extra time available. This behavior stems from the belief that they can complete the task within the allocated time, leading to a lack of urgency and potential delays.

On the other hand, Parkinson's Law states that work expands to fill the time available for its completion. In other words, if there is a deadline set for a task, individuals will often take the entire allocated time to complete it, even if it could have been done more efficiently in a shorter period. This can lead to inefficiencies and delays in project execution.

Both the student syndrome and Parkinson's Law can have detrimental effects on project organizations. They can result in delays, missed deadlines, and a lack of productivity. When individuals consistently delay starting tasks or take longer than necessary to complete them, it can disrupt the overall project timeline and impact the delivery of the project.

To avoid these effects, critical chain multi-project management (CCPM) offers a solution. CCPM focuses on combining buffers to create a more realistic and achievable project schedule. By incorporating buffers into the project plan, CCPM aims to account for uncertainties and potential delays, effectively mitigating the impact of the student syndrome and Parkinson's Law.

In CCPM, rules are used to estimate the duration and effort of tasks. These rules take into account the inherent variability and uncertainties in project execution. By considering the potential risks and uncertainties, CCPM provides a more accurate estimation of task duration and effort, enabling better planning and resource allocation.

By implementing CCPM, project organizations can create a more transparent and reliable project progress monitoring system. The use of buffers allows for a more realistic assessment of project timelines and helps to identify potential bottlenecks or areas of concern. This enables project managers to focus on addressing critical issues and allocating resources effectively.

In conclusion, the student syndrome and Parkinson's Law can have detrimental effects on project organizations, leading to delays and inefficiencies. However, by implementing CCPM and incorporating buffers into the project plan, these effects can be mitigated. CCPM provides a more accurate estimation of task duration and effort, allowing for better planning and resource allocation. This ultimately leads to improved project execution and increased chances of project success.

A3.3 Plan for the Unforeseen- Project Buffer and Estimates

In project management, it is crucial to plan for the unforeseen. No one intentionally delays a project, but disruptions and risks can arise unexpectedly. To account for these uncertainties, it is important to have a buffer in the project that can absorb any delays or issues that may arise. The goal is not to ensure that every single work package is completed on time, but rather to ensure that the project as a whole is completed as quickly as possible.

To implement this approach in planning, individual buffers at the work package level are eliminated. Instead, an overall project buffer is established at the end of the project to safeguard the project's due date. This concept is known as buffer bundling, similar to how insurance companies operate. Not every work package will experience delays or require buffer time, but only a few. The overall project buffer absorbs the troubles and risks of these specific work packages.

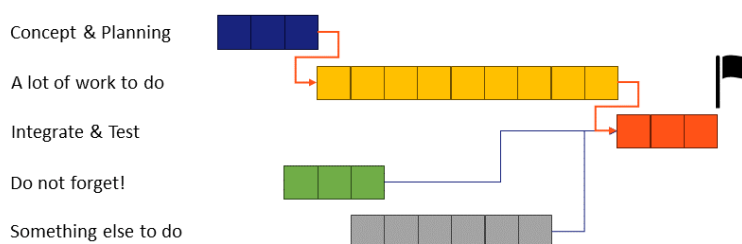
In critical chain multi-project management (CCPM), estimating the duration of work packages is a key aspect. There are different methods for estimating project durations. If estimates are already available, they are typically around 80% accurate. In CCPM, the duration is cut in half, and 50% of the remaining time is added to the buffer. This ensures that the buffer is sufficient to handle any potential delays.

Another estimation method used in CCPM is the P3 point estimation. This involves estimating the optimistic, realistic, and pessimistic completion times for a work package. The optimistic completion time represents the best-case scenario, where everything goes perfectly. The pessimistic completion time represents the worst-case scenario, where everything goes wrong. The realistic completion time is the estimate that is used for project planning, as it represents the duration that is likely to be met or exceeded in 50% of cases.

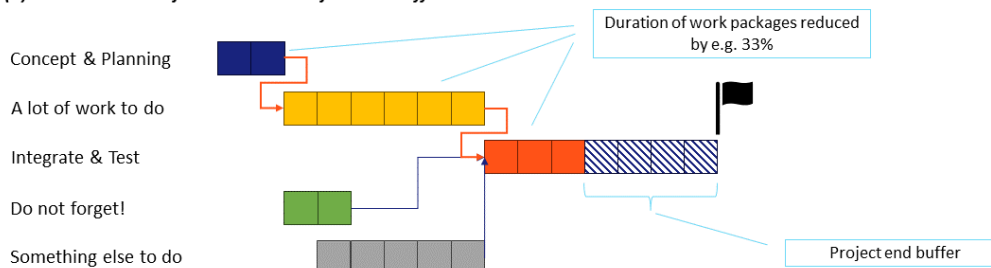
It is important to understand the difference between effort and duration in project planning. Effort refers to the amount of work required to complete a task, while duration refers to the amount of time it takes to complete the task. For example, if two employees work full-time on a work package for one week, the duration would be five days, but the effort would be calculated as 5 days * 8 hours/day * 2 people = 80 hours.

By implementing these strategies and understanding the concepts of buffer bundling, estimation methods, and the distinction between effort and duration, project planning can be enhanced. This ensures that projects have the necessary buffer to handle unforeseen delays and risks, and ultimately leads to greater project stability and timely completion.

(B) Slightly rearranged, Critical Chain is visible and on top, Feeding chains from below, ...



(C) Critical Chain Project Plan with Project End Buffer



(C) CCPM project plan with dedicated "Project (End) Buffer", original duration of work packages reduced by, in this case, 33%, 50% of the critical chain added as project end buffer

A3.4 Leadership Principles for Flow

In Critical Chain multi-project management, new leadership principles are introduced to improve project outcomes. One key principle is recognizing that estimates are not commitments, but rather best guesses based on experience and assumptions. This understanding allows for continuous evaluation and adjustment of estimates as the project progresses. By avoiding the treatment of estimates as commitments, organizations can overcome challenges and achieve better project outcomes.

In traditional project planning, estimates are often treated as commitments, leading to employees padding their estimates with safety buffers. This practice stretches out project durations and hinders project execution. Critical Chain emphasizes that estimates should remain estimates and not be transferred to agreed due dates for single work packages in the project plan. Furthermore, no one is judged solely based on adherence to a single work package completion date.

Another important principle in Critical Chain is the adoption of a relay runner approach. When a work package is handed over to a team, they should be prepared to start immediately and work as fast as possible. The focus is on smooth handovers and maintaining a "focus and finish" mentality. Managers play a servant leadership role in supporting this approach and removing obstacles that the team cannot solve themselves. Their main questions are centered around how long it will take to finish a task and how they can support the team.

To effectively implement these principles, control over work in progress (WIP) is crucial. It is necessary to reduce WIP in the organization and embrace the road runner/relay runner principle. By doing so, project wait time, which refers to the time when a project is waiting for someone to work on it due to people being busy elsewhere, is significantly reduced. This reduction in WIP allows for smoother project execution and improved flow.

Additionally, in Critical Chain, there is potential to shorten project buffers by up to 50%. This means that project durations can be shortened by 25%. However, it is important to note that the remaining buffer must not be deleted by anyone. The buffer serves as a safeguard to protect against uncertainties and ensure project completion within the desired timeframe.

In conclusion, by adopting new leadership principles in Critical Chain multi-project management, organizations can improve project outcomes. These principles include treating estimates as best guesses, avoiding committed deadlines, adopting a relay runner approach, controlling WIP, and shortening project buffers. By implementing these principles, organizations can achieve better project flow and increase their chances of successful project completion.

A3.5 Integration or Feeding Buffer

In the world of critical chain multi-project management, the protection of the critical chain is of utmost importance. As we know, the critical chain acts as the bottleneck for a single project, and it is crucial to safeguard it from any disruptions or delays. One way to achieve this is through the use of integration buffers.

Integration buffers serve as a shield against the potential risks that arise from the integration of feeding chains into the critical chain. These feeding chains, which contribute to the overall project, can introduce uncertainties and difficulties that may impact the critical chain. To prevent such disruptions, integration buffers are strategically placed at the end of each feeding chain.

Calculating integration buffers follows the same principle as project buffers. Instead of allocating a 50% buffer on the feeding chains, this buffer is removed and replaced with an integration buffer. This

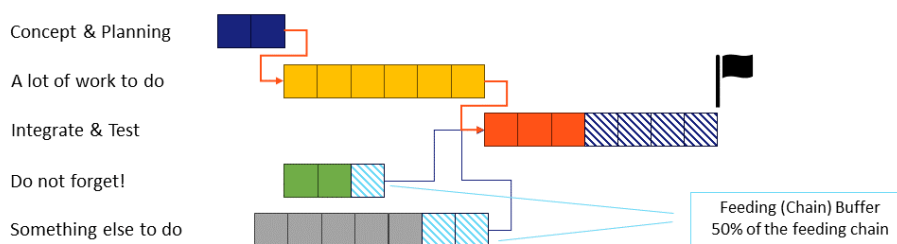
ensures that the critical chain remains protected and shielded from any unforeseen challenges that may arise from the feeding chains.

By implementing integration buffers, we are able to maintain a smooth flow of work and reduce the risk of delays or disruptions. These buffers act as a safety net, absorbing any variations or uncertainties that may occur during the integration process. They provide a cushion for the critical chain, allowing it to proceed without being affected by the potential difficulties of the feeding chains.

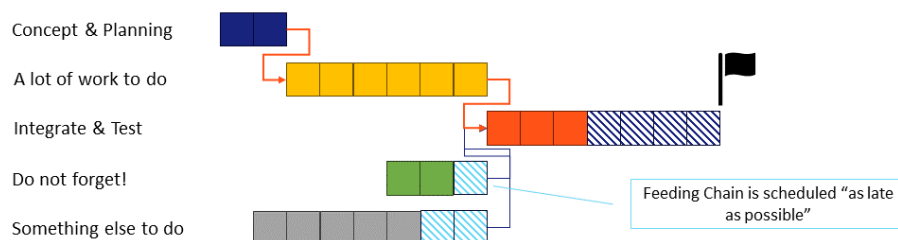
The integration buffers play a vital role in the overall management of multi-project environments. They contribute to the efficient coordination and synchronization of various project elements, ensuring that the critical chain remains the focal point of attention. By prioritizing the critical chain and protecting it through integration buffers, we can effectively manage and control the progress of the entire project.

In summary, the integration buffers serve as a crucial component in critical chain multi-project management. They are calculated in the same manner as project buffers, with the aim of safeguarding the critical chain from disruptions caused by the integration of feeding chains. By strategically placing these buffers, we can ensure a smooth flow of work and minimize the risk of delays or difficulties. Through the implementation of integration buffers, we prioritize the protection of the critical chain and maintain control over the overall project progress.

(D) Critical Chain Project Plan with additional Feeding Buffer



(E) Critical Chain Project Plan with additional Feeding Buffer with as late as possible scheduling



(D) Feeding chain also gets 50% of buffer - called Feeding Chain Buffer; (E) Feeding chains scheduled "as late as possible"

A3.6 Milestones- Good or Bad?

In critical chain project management, the approach to milestones is different. Instead of fixed deadlines, milestones are used as end-checks for each work package. This means that the focus is on completing each work package efficiently and effectively, rather than meeting specific dates. By removing the fixed deadlines, the project can benefit from the flexibility and agility of the critical chain method.

The concept of milestones in critical chain is to ensure that the necessary deliverables are completed before moving on to the next phase. This is done by establishing clear goals and checkpoints within each work package. By achieving these milestones, the project can progress smoothly and efficiently.

It is important to note that in critical chain, milestones are not fixed to specific dates. This is because fixing milestones to specific dates can create artificial project ends and undermine the effectiveness of the project buffer. The project buffer is a crucial element in critical chain, as it allows for flexibility and risk reduction. By removing fixed milestones, the project can benefit from the mathematical calculations behind the project buffer and shorten the critical chain.

However, there may be cases where a specific date for an intermediate result is necessary, such as when it is bindingly promised to a customer or when it is tied to external resource slots. In these rare cases, the milestone can be fixed to a specific date. However, it is important to buffer these milestones to protect against potential delays and ensure the overall project timeline is not compromised.

For all other interim results, it is recommended to mark them as content-related milestones without specific deadlines. This allows for a smoother flow of work and reduces the risk of time wasted on unnecessary deadlines. By focusing on the completion of work packages and the overall project deadline, the critical chain approach can improve efficiency and reduce the negative effects of Parkinson's Law and Student Syndrome.

In conclusion, milestones are not inherently bad in project management. However, in the context of critical chain, fixed milestones with specific dates should be avoided to maintain the flexibility and risk reduction benefits of the method. By focusing on work package completion and the overall project deadline, the critical chain approach provides a more efficient and effective way of managing projects.

A4 Execution

In many companies, project plans often lead a sad existence: they are set up at the start of the project and then disappear into a drawer, and the project begins. As unforeseen events are an inherent part of every project practice, the plan and reality start to diverge. That's why CCPM uses specialized software to keep project plans up to date and to track buffer consumption in real-time. In this process, project team members report back daily on the progress of their active tasks and how much time they estimate they still need to complete them. This creates an unparalleled level of transparency and speed in project execution. At the same time, the ratio of buffer consumption to project progress is used to calculate a priority number, known as the operational priority of the work packages. The next chapter will explain how this operational priority is applied.

The execution of a project is where the rubber meets the road. A plan without execution is worthless. It is during the execution phase that the plan is put into action and progress is made towards achieving the project's objectives. However, it is important to remember that no plan survives reality. Unexpected events and changes are bound to occur, and it is crucial to adapt and adjust the plan accordingly.

To ensure successful execution, it is essential to keep the plan up to date. This means regularly reviewing and revising the plan based on the latest information and circumstances. CCPM provides the tools and techniques to do this effectively. By using the daily feedback from project team members on task completion and estimated remaining time, the project plan can be continuously adjusted and optimized.

One of the key aspects of execution is determining operational priority. This is where the operational priority number, derived from the ratio of buffer consumption to project progress, comes into play. The work packages with the highest operational priority are given the highest priority for resource allocation and completion. This ensures that the most critical tasks are addressed first and that the project stays on track.

By using CCPM and its focus on execution, projects can benefit from increased transparency, agility, and speed. The daily updates and adjustments to the plan enable teams to respond quickly to changes and make informed decisions. This leads to improved project performance and a higher likelihood of achieving project objectives on time and within budget.

In conclusion, execution is a critical phase in project management. It is where the plan is put into action and progress is made towards project objectives. CCPM provides the tools and techniques to keep the plan up to date and determine operational priority. By focusing on execution and continuously adjusting the plan, projects can benefit from increased transparency, agility, and speed, ultimately leading to successful project outcomes.

A4.1 Priorities: Why Do I Need Operational Priorities?

In companies, priorities are typically set based on various factors such as project deadlines, resource availability, and strategic importance. When it comes to multi-project management, the challenge becomes even greater as deadlines may shift and projects may require the same resources simultaneously.

To manage this effectively, critical chain multi-project management (CCPM) provides a solution by introducing the concept of operative priorities. CCPM utilizes the planned project buffer, which is a time buffer added to the end of each project to account for uncertainties and delays.

The key idea behind operative priorities in CCPM is to prioritize projects based on their buffer index. The buffer index is calculated by dividing the buffer consumption (current buffer duration divided by initial planned buffer duration) by the progress on the critical chain (current project duration divided by current project duration plus remaining duration).

Let's consider an example where two projects are waiting to be processed before a critical resource. Project A has a low buffer index, indicating less buffer consumption in relation to its progress. On the other hand, Project B has a high buffer index, indicating high buffer consumption and very low progress.

In this scenario, the task manager would prioritize Project B as it has a higher buffer index. By doing so, both projects have a higher chance of being completed on time. This prioritization is applied to all ongoing projects and their respective work packages throughout the company, ensuring a comprehensible and automatic prioritization mechanism.

The use of operative priorities calculated through the buffer index takes a significant amount of pressure off managers. It allows them to easily determine the most important tasks and ensures that employees can focus on completing those tasks. This mechanism plays a fundamental role in ensuring that all projects are delivered on time and contributes to the overall success of the company.

In a broader context, priorities are also set in other areas such as traffic management on streets. Traffic signals and signs are used to manage the flow of vehicles and prioritize certain directions or lanes. This helps to maintain order and prevent congestion, ensuring a smooth and efficient movement of traffic.

Overall, the concept of operative priorities is crucial in managing multiple projects and resources effectively. Whether it is in the context of project management or traffic management, setting priorities based on specific criteria allows for better decision-making and ensures that the most important tasks or directions are given the necessary attention and resources.

A4.1.1 The Fever Curve in CCPM

In Critical Chain Project Management (CCPM), the concept of the Fever Curve plays a crucial role in ensuring the successful delivery of multiple projects. The staggering of projects is a key strategy employed to ensure that each team has enough capacity to effectively deliver all projects. This approach aims to prevent overloading and ensure that resources are allocated optimally.

With the implementation of CCPM, it becomes essential for everyone involved to have a clear understanding of where they can contribute to make project delivery reliable. The Fever Curve serves as a visual indicator of project progress and buffer consumption, providing real-time insights into the urgency and status of each project.

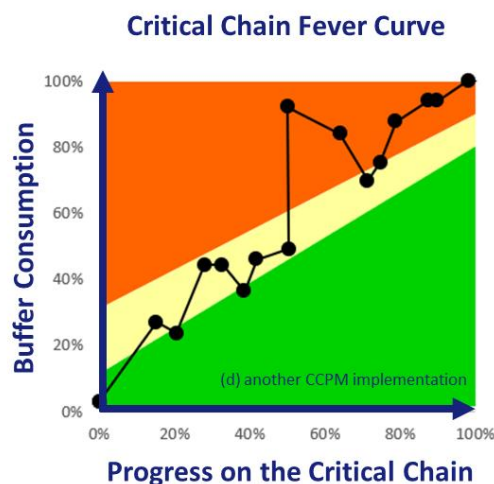
The Fever Curve is a diagram that depicts the relationship between buffer consumption and progress. It is drawn with the x-axis representing project progress and the y-axis representing buffer consumption, both measured in percentages. All projects start at the lower left corner of the curve and are expected to move towards the upper right corner as they progress. The goal is for projects to finish near the top right corner, with a buffer consumption of around 90%, allowing for any unforeseen issues in the final stages.

The Fever Curve is divided into three distinct areas: red, yellow, and green. The red zone indicates that the buffer is being consumed at a faster rate than progress is being made. This signals a need for immediate action to address the situation and prevent delays. The yellow zone represents a moderate level of buffer consumption, indicating that attention and resources are required to

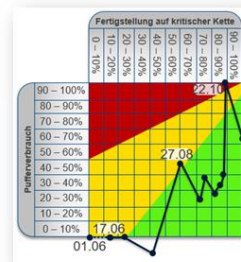
maintain progress and prevent the project from entering the red zone. Finally, the green zone signifies that the project is on track, with buffer consumption aligned with progress.

The Fever Curve serves as a useful tool for teams to focus their efforts on buffer regain. By monitoring the curve and aiming to stay within the yellow or green zones, teams can prioritize their actions and allocate resources effectively. This approach ensures that projects remain on schedule and that any potential risks or delays are addressed promptly.

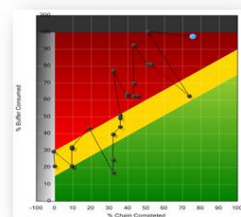
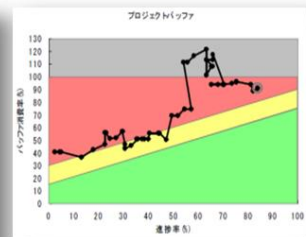
In summary, the Fever Curve is a core element of CCPM, providing real-time insights into project progress and buffer consumption. By understanding and utilizing this visual indicator, teams can effectively manage multiple projects, allocate resources appropriately, and ensure reliable project delivery.



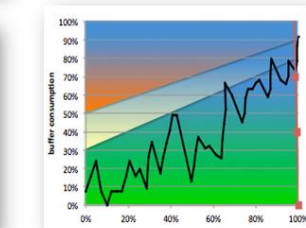
(a) a 10.000 person day project



(d) the Mazda 6



(c) a CCPM implementation



(d) Wire Swiss—an agile APP development

Examples of different Fever Curves

A4.1.2 Buffer Index as Operational Priority

In the realm of critical chain multi project management, one of the key aspects that determines operational priority is the buffer index. This index is derived from two important factors: progress and buffer consumption. Let's delve into these formulas and understand how they contribute to the overall operational priority.

Firstly, progress is calculated by considering the advancement made in completing a task or project. It is a measure of how much work has been accomplished relative to the total work required. This progress formula helps in assessing the current state of each task and project, providing a clear picture of where things stand.

On the other hand, buffer consumption is a measure of how much buffer has been utilized in relation to the progress made. The buffer, which acts as a protective cushion against uncertainties and delays, is an essential component in project management. As work progresses, the buffer is gradually consumed, indicating the level of risk and potential delays.

Now, let's explore the concept of buffer index. It is a metric that combines progress and buffer consumption to determine the operational priority of a task or project. The higher the buffer index,

the more critical and urgent the task becomes. This index serves as a guide for decision-making, helping project managers and teams identify which tasks require immediate attention and resources.

Operational priority is crucial in ensuring that all orders are delivered on time and that the overall project timeline is maintained. By focusing on tasks with the highest buffer index, teams can allocate resources effectively and expedite actions when necessary. This approach helps in restoring stability and ensuring timely delivery performance.

Implementing buffer index as an operational priority requires a systematic approach. It involves continuously monitoring and analyzing the progress and buffer consumption of each task and project. By doing so, companies can identify potential risks and delays, allowing them to take proactive measures to mitigate these issues.

In conclusion, the buffer index serves as a valuable tool in critical chain multi project management. It provides a clear and transparent system for setting operational priorities, ensuring that the most urgent tasks receive the necessary attention and resources. By understanding and utilizing the progress and buffer consumption formulas, companies can effectively manage their projects, improve efficiency, and achieve better outcomes.

In the world of multi-project management, operational priority plays a crucial role in ensuring efficient and effective project execution. It is important to have a clear and transparent understanding of which projects require immediate attention and support. One way to determine operational priority is by analyzing the buffer consumption of each project.

The buffer, in the context of multi-project management, refers to the amount of time or resources allocated to a project to account for uncertainties and delays. The critical chain, on the other hand, represents the sequence of tasks that determine the overall project duration. By comparing the buffer consumption of different projects, we can identify the most critical ones that require immediate action.

To achieve timely transparency on the status of all initiatives, it is essential to have a complete overview of the entire portfolio. This allows us to identify where and when buffers are being used up, serving as a starting point for continuous improvement. By implementing a cross-process improvement process, we can address bottlenecks and optimize resource allocation.

In multi-project management, it is common for deadlines to shift and for projects to compete for the same resources. This poses a challenge in determining which project should be prioritized operationally. The TOC methodology, known as Buffer Management, provides a solution by using the planned project buffer. It suggests that the project with the worst ratio of buffer consumption to progress on the critical chain should be given priority.

Agility is also an important aspect of multi-project management. By analyzing the progress and buffer consumption of each initiative, we can determine the operational priority. The initiative with the highest buffer consumption compared to progress is considered the most critical and requires all possible support. This approach allows for clear operational priorities and helps avoid negative multitasking.

Top managers play a crucial role in providing assistance and guidance in multi-project management. The Critical Chain Buffer Management system is used to provide priorities, and priority reports are provided to different management functions. This ensures proper usage of the priority information and helps in making informed decisions.

When planning buffers, the priority can be calculated based on the demand prioritization method. This method involves identifying the bottleneck and prioritizing the projects accordingly. By

understanding the roles and actors involved in multi-project management, we can effectively prioritize projects and allocate resources operationally.

In conclusion, operational priority is a critical aspect of multi-project management. By analyzing buffer consumption, identifying bottlenecks, and prioritizing projects based on their progress and buffer consumption, we can ensure efficient project execution. With timely transparency and clear operational priorities, we can avoid negative multitasking and achieve successful project outcomes.

A4.2 Strategic and Operational Priority

In the world of project management, companies often find themselves with multiple projects that are ready to start simultaneously. These projects vary in their potential impact on the company's strategic goals. It is crucial, therefore, to prioritize the projects that will make the greatest contribution to these objectives and launch them first. This concept forms the foundation of strategic project prioritization.

Strategic prioritization involves determining the order in which projects are launched based on their alignment with the company's strategic goals. Projects that are deemed to have a higher strategic value are given priority and are launched before others. This ensures that the company focuses its resources and efforts on projects that will have the most significant impact on its overall objectives.

Once the projects have been launched, the focus shifts to operational priority. Operational priority determines the order in which the work packages of the projects are processed. This prioritization is based on factors such as resource availability, project dependencies, and project deadlines. The operational priority takes precedence over the strategic priority at this stage, as it ensures that the projects progress smoothly and efficiently.

While strategic prioritization is crucial in determining the order in which projects are launched, its importance diminishes once the projects are in execution. At this stage, the focus shifts to the buffer index, which measures the availability of buffer time in the project schedule. The buffer index becomes the primary factor in determining the priority of work packages within the projects. This ensures that the projects stay on track and any potential delays are identified and addressed promptly.

In summary, strategic prioritization is essential in determining the order in which projects are launched based on their alignment with the company's strategic goals. Once the projects are in execution, operational priority takes precedence in determining the order in which work packages are processed. The buffer index becomes the primary factor in ensuring that the projects stay on schedule. By effectively balancing strategic and operational priorities, companies can maximize their project success and achieve their strategic objectives.

A4.3 Closed Loop Control Mechanism in CCPM

In critical chain multi-project management (CCPM), the close loop control mechanism plays a crucial role in ensuring the successful execution of projects. This control mechanism consists of various control structures that are implemented along the project execution pipeline.

One example of a control structure is the self-control of the teams. This involves empowering the teams to take ownership of their tasks and monitor their progress. By having this level of autonomy, teams can identify any potential issues or delays early on and take corrective actions to keep the project on track.

Another control structure is the robustness of the project plan. In CCPM, there is a focus on minimizing planning overhead while still ensuring a comprehensive and reliable plan. This means that

the project plan is designed to be flexible and adaptable, allowing for adjustments to be made as needed without causing significant disruptions to the overall project timeline.

The late start of tasks is also a control parameter in CCPM. By starting tasks as late as possible, the project team can maximize the utilization of available resources and minimize the risk of resource constraints. This approach helps to optimize the project schedule and ensure that tasks are completed in a timely manner.

Broad applicability is another characteristic of CCPM's control mechanism. Unlike traditional project management methods that are often specific to certain industries or sectors, CCPM can be applied to various types of projects, including software development. This versatility makes CCPM a valuable tool for multi-project environments where there are multiple tasks to be processed simultaneously.

The close loop control mechanism in CCPM is designed to continuously monitor and adjust the project's progress. It ensures that the project stays on track and meets the promised deadlines. By implementing this control mechanism, organizations can effectively manage multiple projects and seize desirable business opportunities as soon as possible.

Overall, CCPM's close loop control mechanism is a powerful tool for project management. It combines the principles of lean production management with specific skills required for successful multi-project execution. With its focus on handling uncertainty and understanding the impact of performance measurements on human behavior, CCPM provides a comprehensive approach to project management that can lead to breakthrough results.

In a CCPM controlled environment, the control structures play a crucial role in maintaining the flow of projects and ensuring that critical projects are consistently accelerated, resulting in a 95% on-time delivery rate. These control structures operate at different levels and serve specific purposes to effectively manage projects.

The pipeline meeting is responsible for the orderly introduction of new projects into the system. Its primary objective is to protect the bottleneck from being overwhelmed or underutilized. During this meeting, new projects are evaluated and prioritized based on their strategic importance and resource availability. By carefully managing the pipeline, the organization can ensure that projects are initiated in a controlled manner, minimizing disruptions and maximizing efficiency.

The steering committee plays a vital role in ensuring that ongoing projects remain on track and meet their deadlines. Comprised of key stakeholders and decision-makers, the steering committee provides oversight and guidance to project teams. They review project progress, address any issues or roadblocks, and make critical decisions to keep projects aligned with organizational goals. By actively monitoring and steering projects, the steering committee helps maintain project momentum and ensures timely delivery.

The shopfloor meeting focuses on continuous improvement at an operational level. This meeting brings together project management professionals to discuss and analyze project management processes. By sharing best practices, identifying areas for improvement, and implementing corrective actions, the shopfloor meeting helps enhance the effectiveness and efficiency of project management practices. It serves as a platform for learning, collaboration, and innovation, enabling the organization to continually refine its project management capabilities.

The daily project team meeting is a crucial component of effective project execution. This meeting brings together the project team members to discuss progress, address challenges, and coordinate activities. By providing a forum for open communication and collaboration, the daily project team meeting ensures that everyone is aligned and working towards the project's objectives. It allows for

timely problem-solving, resource allocation, and decision-making, enabling the project to be executed optimally.

In summary, the control structures in CCPM controlled environments are designed to maintain project flow and accelerate critical projects. The pipeline meeting ensures the orderly introduction of new projects, the steering committee provides oversight and guidance, the shopfloor meeting focuses on continuous improvement, and the daily project team meeting facilitates effective project execution. By leveraging these control structures, organizations can enhance their project management capabilities and achieve consistent on-time delivery.

A4.3.1 Steering Committee

The Steering Committee plays a crucial role in the management of projects within an organization. Comprised of senior management members, this committee is responsible for overseeing the progress and success of various projects. One of the key responsibilities of the Steering Committee is to ask important questions to project managers, particularly those in charge of critical or stuck projects.

For red (critical) projects, the Steering Committee asks the project managers two main questions. Firstly, they inquire about the buffer regain measures that the Project Leader (PL) and their team are implementing to bring the project back to the yellow zone. This question aims to understand the strategies and actions being taken to address any issues or delays in the project. Secondly, the committee asks where management can provide assistance. This question emphasizes the importance of collaboration and support from senior management to ensure the successful completion of critical projects.

Similarly, for stuck projects, the Steering Committee asks the project managers two key questions. Firstly, they inquire about the measures being implemented by the PL and their team to get the project back on track. This question aims to understand the specific actions being taken to overcome any obstacles or challenges that have caused the project to stall. Secondly, the committee asks where management can offer assistance. This question highlights the importance of identifying areas where senior management can provide guidance, resources, or support to help move the project forward.

In addition to asking these important questions, it is crucial for the Steering Committee to follow up on the success of the planned measures. Persistence is key in ensuring that the actions taken by project managers and their teams are effective in resolving any issues or delays. If the planned measures do not yield the desired results, the committee must continue to follow up and explore alternative solutions to ensure the project's success.

Overall, the Steering Committee plays a vital role in project management by actively engaging with project managers, asking important questions, and providing support and guidance. Their involvement and follow-up are essential in ensuring the smooth progress and successful completion of projects within the organization.

A4.3.2 Pipeline Meeting

The pipeline meeting is a crucial aspect of project management, as it addresses several important questions and concerns. One of the primary focuses of this meeting is to determine the number of projects that are currently labeled as "black." The ultimate goal is to keep this number at zero, indicating that all projects are progressing smoothly without any major issues or delays.

Another key aspect discussed in the pipeline meeting is the number of projects that are currently labeled as "red." The objective here is to keep these projects below a threshold of 10-15%. This

indicates that while there may be some challenges or obstacles, they are being effectively managed and controlled.

During the meeting, the team also discusses the projects that are expected to be realized in the near future, providing precise timelines. Additionally, they also consider projects that are planned for the more distant future, providing rough estimates. This helps in aligning resources and planning for upcoming projects.

The pipeline meeting also involves evaluating the maturity of projects that are about to start. It is essential to ensure that these projects have the necessary maturity and are equipped with all the required resources and information to commence successfully.

Furthermore, the meeting involves making decisions regarding when to start new projects or evaluating scenarios and trade-offs for introducing new projects. This requires the involvement of top management to assess the feasibility and impact of new projects on the existing pipeline.

A critical aspect of the pipeline meeting is comparing the actual throughput of projects to the planned throughput. This helps in identifying any deviations or discrepancies and allows for adjustments to be made accordingly. It also helps in determining if the bottleneck, which refers to the constraint that limits the overall throughput, is still in the right place and if it is stable.

In addition to these considerations, the pipeline meeting also examines other key performance indicators (KPIs) such as on-time delivery, throughput per month, and bottleneck load. These metrics provide insights into the overall performance and efficiency of the project pipeline.

Lastly, the pipeline meeting addresses the question of whether additional staff is needed and if so, where. This is particularly important in identifying areas where the bottleneck may need to be expanded to ensure smooth project flow and avoid any delays.

Overall, the pipeline meeting serves as a comprehensive platform to discuss and address various aspects of project management, ensuring that projects are progressing smoothly, challenges are managed effectively, and resources are allocated optimally.

A4.3.3 Shop Floor Meeting

A shop floor meeting is a crucial gathering of individuals who are responsible for managing resources on the production floor. This meeting is held regularly and is designed to address any disruptions or issues that may arise during the value creation process. The main objective of these meetings is not to dwell on the problems themselves, but rather to focus on finding solutions and implementing permanent improvements.

The purpose of a shop floor meeting is to shift away from a reactive, fire-fighting approach and move towards achieving a "perfect day" in terms of production efficiency and effectiveness. During these meetings, the team discusses any challenges or obstacles that have been encountered and collaboratively works towards finding ways to overcome them.

The emphasis is placed on problem-solving and continuous improvement. The participants actively engage in brainstorming sessions to identify the root causes of the issues and come up with innovative solutions. The goal is to implement changes that will prevent similar problems from occurring in the future, ultimately leading to a smoother and more efficient production process.

In a shop floor meeting, open communication and collaboration are key. All team members are encouraged to share their insights, ideas, and suggestions for improvement. This inclusive approach

ensures that everyone's expertise and perspectives are taken into account, leading to more comprehensive and effective solutions.

The shop floor meeting serves as a platform for fostering a culture of continuous improvement within the organization. It encourages employees to actively participate in problem-solving and take ownership of their work areas. By addressing disruptions and finding solutions together, the team becomes more empowered and motivated to achieve higher levels of performance.

Overall, the shop floor meeting is a vital component of effective resource management and production optimization. It provides a structured forum for addressing challenges, finding solutions, and driving continuous improvement. By focusing on permanent improvements rather than temporary fixes, these meetings contribute to the overall success and efficiency of the organization's value creation process.

A4.3.4 Daily Project Team Meeting

The daily project team meeting, also known as the stand-up, serves as a crucial tool in improving communication and the overall project process. Its primary purpose is to facilitate faster feedback, which in turn increases the speed at which the team progresses with the project. By addressing barriers and obstacles early on, the team can promptly resolve any issues that may arise.

The stand-up meeting also plays a vital role in ensuring that the entire team is moving in the same direction and working together towards a common goal. Through daily synchronization, team members can align their efforts and stay on track with the project's objectives. This level of coordination helps to maintain a cohesive and efficient workflow.

One of the key aspects of the stand-up meeting is its focus on the Fever Curve signal and buffer regain. The Fever Curve provides real-time indicators of critical projects, allowing the team to identify which projects require immediate attention and resources. By staying within the yellow zone of the Fever Curve, the team can ensure that progress and buffer consumption are effectively managed.

During the stand-up, the team discusses the progress versus buffer consumption, keeping the delivery date at the forefront of their minds. This helps to maintain focus and encourages the team to proactively address any process problems that may arise. Additionally, the stand-up meeting serves as a platform for team members to offer support and assistance to one another, ensuring that tasks are completed efficiently and obstacles are overcome.

Overall, the daily project team meeting is an essential component of critical chain multi-project management. It fosters effective communication, promotes collaboration, and enables the team to stay on track with project goals. By leveraging the Fever Curve signal and maintaining a focus on buffer regain, the team can increase stability, reliability, and ultimately achieve project success.

A4.4 Specific CCPM Role Definitions

In CCPM, the role of a Project Manager is crucial. They are responsible for overseeing the overall execution of the project, ensuring that it stays on track and meets the set deadlines. The Project Manager coordinates with various teams and departments to ensure smooth communication and collaboration throughout the project.

The Resource Manager plays a vital role in CCPM by ensuring that the necessary resources are available and allocated efficiently to different projects. They are responsible for managing the availability and utilization of key resources, such as manpower, equipment, and materials. The Resource Manager works closely with the Project Manager to ensure that the right resources are allocated to each project at the right time.

The Task Manager is responsible for managing individual tasks within a project. They ensure that tasks are properly planned, assigned to the right team members, and executed according to the project schedule. The Task Manager monitors the progress of each task and addresses any issues or delays that may arise. They work closely with the Project Manager and Resource Manager to ensure that tasks are completed on time and within budget.

The Pipeline Manager is responsible for managing the project portfolio and prioritizing projects based on available resources. They ensure that projects are started at the right time, considering the availability of key resources and the overall capacity of the organization. The Pipeline Manager works closely with the Project Manager and Resource Manager to optimize the number of in-progress projects and ensure that the portfolio is managed effectively.

Top Management, including executives and senior leaders, is responsible for overseeing the entire project portfolio and ensuring that it is in good condition. They define the "good condition" of the portfolio based on factors such as project performance, resource utilization, and alignment with strategic objectives. Top Management is responsible for making strategic decisions regarding project prioritization and resource allocation in both the short-term and medium-term perspectives.

In managing the portfolio in a short-term perspective, the roles of the Project Manager, Resource Manager, Task Manager, and Pipeline Manager are involved in tactical prioritization. They work together to prioritize projects based on immediate resource availability and project deadlines. They ensure that projects are executed efficiently and that resources are allocated effectively to meet short-term goals.

In managing the portfolio in a medium-term perspective, the roles of the Project Manager, Resource Manager, Task Manager, and Pipeline Manager are involved in strategic prioritization. They consider long-term resource availability, project dependencies, and strategic objectives to prioritize projects. They work together to align the project portfolio with the organization's strategic goals and ensure that resources are allocated in a way that maximizes long-term value.

Buffer losses, which refer to the consumption of project buffers due to delays or disruptions, can be absorbed through effective management and mitigation strategies. The roles of the Project Manager, Resource Manager, Task Manager, and Pipeline Manager play a crucial role in identifying potential risks and implementing measures to minimize buffer losses. They monitor project progress, address issues promptly, and make necessary adjustments to ensure that buffer losses are minimized and the project stays on track.

Overall, CCPM provides specific role definitions for the Project Manager, Resource Manager, Task Manager, and Pipeline Manager to ensure effective project management and portfolio optimization. These roles work together to achieve the highest possible throughput of projects, meet deadlines, and deliver successful outcomes.

A4.4.1 Project Manager

As a critical chain multi project management expert, the responsibility of the project manager is crucial in ensuring the success of a project. The project manager is accountable for creating a complete and well-controllable plan, and they are also responsible for ensuring that the team, resource managers, and task managers are aware of their roles and responsibilities in initiating buffer recovery actions when necessary. It is the project manager's duty to document these actions and track their effectiveness.

One of the tasks of the project manager is to explain the meaning and benefits of the project and how it serves the company. They provide the necessary information and guidance to ensure that

everyone involved understands the purpose and importance of the project. Additionally, the project manager is responsible for obtaining the necessary resources and support from all resource managers. They ensure that the work packages have been properly checked and estimated in terms of time and effort.

Keeping the project plan up to date is another crucial task of the project manager. They ensure that any changes or updates are accurately reflected in the plan and communicated to the team. The project manager also acts as the main point of contact for the project, both internally and externally. They represent the project in steering committees and ensure that necessary transparency and reports are provided.

Monitoring the critical chain and supply buffers is an important responsibility of the project manager. They keep a close eye on these buffers and take action if necessary to ensure that the project stays on track. If buffer regain management is required, the project manager drives the process and ensures that data about the root causes for buffer regain are collected for further investigation and continuous improvement.

In addition to these responsibilities, the project manager may also perform other technical tasks within the project. This can include tasks such as ensuring product cost compliance, managing communication, addressing risks, and maintaining quality standards.

It is important to note that the project manager is not responsible for time, scope, and budget. These aspects are typically managed by other stakeholders or departments within the organization. The project manager's focus is primarily on the overall coordination and execution of the project, ensuring that all necessary tasks are completed and that the project progresses smoothly.

In summary, the project manager plays a critical role in the success of a project. They are responsible for creating and maintaining a well-controlled plan, initiating buffer recovery actions, and ensuring effective communication and coordination among team members. While they may perform various technical tasks within the project, their primary responsibility lies in overseeing the project's execution and ensuring its overall progress.

Creating a controllable project plan is crucial for the success of any project. To achieve this, there are several key factors that need to be considered. Firstly, it is essential to have a clearly defined goal for the project, supported by a compelling business case. This ensures that everyone involved understands the purpose and value of the project.

Open and effective communication among all stakeholders is another important aspect. This includes decision-makers, project managers, and team members. By fostering clear and open communication, everyone can have a shared understanding of the project objectives and requirements. This helps to avoid misunderstandings and ensures that everyone is on the same page.

To determine whether a project plan is well-controllable, there are certain criteria that can be used as a checklist. Firstly, the focus should be on a few relevant deliverables, also known as work packages. These deliverables should be defined based on functional aspects rather than hierarchy, teams, or divisions. This ensures that the project plan remains focused and manageable.

The critical chain, which determines the duration of the project, must be clearly defined and visible. It is important to ensure that the feeding chains, which are the tasks that lead into the critical chain, are significantly shorter. This reduces the probability of changes to the critical chain and helps to maintain control over the project.

Work packages should be sized in a way that allows the task manager to provide reliable updates on the remaining duration on a daily basis. Typically, the duration of work packages should not exceed

two to three weeks. However, in cases where detailed subtask management or physical processes are involved, the duration can be longer as long as the remaining duration can still be determined.

Each work package should have a clear definition of what constitutes "done," which should be negotiated with the consumer of the results. This ensures that there is a shared understanding of the expected outcomes and helps to avoid any ambiguity.

Ownership of each work package should be assigned to a specific resource or task manager. This person should have the most effort or the biggest interest in delivering a high-quality outcome. By assigning ownership, accountability is established, and it becomes clear who is responsible for the successful completion of each work package.

When estimating the duration and effort required for each work package, it is important that these estimates are made by the resource or task manager, rather than the project manager. This ensures that the estimates are based on the expertise and knowledge of the individuals who will be carrying out the tasks.

Lastly, the work packages should be sorted in a way that makes the critical chain easy to see. Feeding chains should enter the critical chain from below, allowing for a clear visualization of the project's critical path.

By adhering to these criteria and checklist, a project plan can be developed that is well-controllable. This enables effective monitoring of progress, timely identification of imbalances, and the initiation of corrective actions when necessary. Ultimately, a controllable project plan increases the chances of project success and ensures that projects are delivered on time and within budget.

A.4.4.2 Resource Manager

The Resource Manager plays a crucial role in the critical chain multi project management (CCPM) approach. Their primary responsibility is to ensure that the most critical work package is supplied with resources optimally, enabling it to be delivered quickly and with the highest quality. This involves a range of tasks and responsibilities that contribute to the overall success of the project portfolio.

One of the key tasks of the Resource Manager is to assign the task manager as soon as a task becomes ready to start. This assignment is done based on the operational priority, which is determined using a scatter plot. By carefully considering the priority, the Resource Manager ensures that tasks are allocated to the most suitable task managers, maximizing efficiency and effectiveness.

Additionally, the Resource Manager is responsible for monitoring the performance of their task managers. They regularly check whether the task managers are fulfilling their responsibilities and meeting the required standards. This monitoring helps to identify any potential issues or bottlenecks early on, allowing for timely intervention and resolution.

Another important aspect of the Resource Manager's role is to observe the long-term resource requirements of the projects. They are responsible for ensuring the establishment and development of resources, ensuring that the necessary skills and capacities are available when needed. This proactive approach helps to prevent resource shortages and delays in project execution.

The Resource Manager also plays a crucial role in promoting a flexible and problem-solving mindset within their team. They actively work towards eliminating head monopolies and encourage their team members to develop versatile problem-solving skills beyond their specific field of expertise. This approach fosters a collaborative and innovative work environment, where challenges are tackled collectively for the benefit of the entire project portfolio.

Furthermore, the Resource Manager is responsible for ensuring optimal working conditions for their team. This includes ensuring that the work packages have all the necessary resources and tools, minimizing multitasking to maintain focus and productivity, and providing sufficient breaks to prevent burnout. By prioritizing the well-being and working conditions of their team, the Resource Manager contributes to the overall success and efficiency of the projects.

It is important to note that, especially at the beginning of implementing CCPM, the role of the Resource Manager and the Task Manager may be performed by the same person. This integration allows for a seamless coordination and alignment of tasks and resources, ensuring a smooth transition to the CCPM approach.

In conclusion, the Resource Manager in CCPM has a range of responsibilities and tasks that contribute to the successful management of the project portfolio. From assigning task managers to monitoring performance, observing long-term resource requirements, promoting flexibility and problem-solving skills, ensuring optimal working conditions, and leading the team, the Resource Manager plays a vital role in optimizing project execution and achieving desired outcomes.

A.4.4.3 Task Manager

The Task Manager plays a crucial role in the implementation of Critical Chain Multi Project Management (CCPM). Their responsibility lies in providing daily feedback on the remaining uptime of tasks and taking proactive measures to ensure acceleration and fine-tuning actions across team boundaries, if necessary.

To fulfill their tasks effectively, the Task Manager is required to inquire about the status of the remaining maturities of all parties involved. This involves regularly communicating with team members and stakeholders to gather updates on task progress. By staying informed about the status of each task, the Task Manager can identify any potential bottlenecks or delays and take appropriate actions to address them.

Another important task of the Task Manager is to coordinate problem-solving activities, particularly in relation to buffer regain. In CCPM, buffers are strategically placed to protect the project schedule from uncertainties and variations. If a buffer is consumed or at risk of being consumed, the Task Manager takes the lead in coordinating efforts to regain buffer time and ensure that the project remains on track.

Furthermore, the Task Manager plays a critical role in facilitating smooth handovers between work packages. They keep the task managers informed about the upcoming work packages, enabling them to prepare for a seamless transition. This is particularly important in cases where critical tasks are involved, as any delays or miscommunications during handovers can have a significant impact on the overall project timeline.

It is worth noting that, especially in the initial stages of implementing CCPM, the roles of the Resource Manager and Task Manager may be performed by the same person. This is due to the fact that CCPM introduces a different approach to managing projects, and organizations may need time to adjust and allocate resources accordingly.

In summary, the Task Manager in CCPM is responsible for providing daily feedback on task progress, coordinating problem-solving activities, ensuring smooth handovers between work packages, and actively taking measures to accelerate tasks if needed. Their role is crucial in maintaining project momentum and ensuring that the project portfolio remains in good condition.

A.4.4.4 Pipeline Manager

As a critical chain multi-project management expert, the Pipeline Manager plays a crucial role in ensuring the smooth flow of work within the organization. One of their main responsibilities is to support decision-makers by providing factual decision-making papers that help optimize the start of projects. This involves preparing scenarios and trade-offs that consider various factors and potential risks.

In addition to this, the Pipeline Manager also monitors the stability of the pipeline and identifies any potential bottlenecks. They are responsible for warning the relevant stakeholders in case of an imminent overload or underload, ensuring that the workload is balanced and resources are utilized efficiently.

To fulfill these responsibilities, the Pipeline Manager performs a range of tasks. They prepare decision papers and scenarios whenever necessary, providing valuable insights and recommendations for strategic decisions. They also advise on the definition or change of the bottleneck, helping to identify areas where improvements can be made.

Transparency is a key aspect of the Pipeline Manager's role. They establish transparency regarding buffer consumers, which refers to the projects or processes that consume the buffer time allocated for each project. By understanding these buffer consumers, the Pipeline Manager can develop effective buffer recovery measures to ensure that projects stay on track and any potential delays are mitigated.

Furthermore, the Pipeline Manager supports decision-makers in analyzing structural buffer consumers, which are often caused by process errors or inefficiencies. They work closely with the relevant stakeholders to identify these issues and implement process improvement measures to address them.

In addition to their responsibilities within the pipeline management process, the Pipeline Manager often serves as a contact person and consultant for topics related to Theory of Constraints (TOC) and Critical Chain Project Management (CCPM). They provide guidance and expertise to project managers and other managers, helping them understand and implement these methodologies effectively.

It is important to note that while the Pipeline Manager plays a critical role in optimizing project flow and ensuring the success of the organization, they also rely on the collaboration and cooperation of other stakeholders. The success of the pipeline management process depends on the collective effort of all team members and their commitment to following the established protocols and strategies.

In conclusion, the Pipeline Manager is responsible for supporting decision-makers, monitoring the stability of the pipeline, and ensuring the efficient utilization of resources. Through their tasks, they provide valuable insights, establish transparency, and support process improvement measures. Additionally, they serve as a consultant and contact person for TOC and CCPM topics, providing guidance and expertise to project managers and managers.

A4.4.5 Top Management

Responsibility:

In the realm of critical chain multi project management, the responsibility of ensuring the allocation of new projects in a manner that promotes sustainable growth and increased throughput falls upon the Top Management. This crucial role involves making strategic decisions that contribute to the overall success of the organization.

Tasks:

One of the primary tasks of the Top Management is to ensure that the bottleneck, which refers to the constraint or limiting factor in the system, is never overloaded or underutilized. This involves carefully managing the allocation of resources and staffing the project portfolio in alignment with both short-term and long-term strategies.

Additionally, the Top Management is responsible for effectively managing sales and innovation efforts. They must ensure that the new capabilities created by critical chain multi project management are utilized in a profitable and sustainable manner. This requires a keen understanding of market dynamics and the ability to capitalize on the organization's strengths.

Tracking the effectiveness of buffer recovery measures in projects and process improvements is another important task of the Top Management. By monitoring and evaluating the outcomes of these measures, they can identify areas for improvement and make informed decisions to enhance project performance and overall efficiency.

Furthermore, the Top Management plays a crucial role in fostering cooperative cooperation between project managers, resource managers, and task managers. By promoting collaboration and effective communication among these key stakeholders, they can ensure that projects are executed smoothly and in alignment with the organization's objectives.

Disclaimer:

It is important to note that finding optimal decisions for the entire company typically requires collective input from the entire Top Management team, encompassing all functions within the organization. This collaborative approach ensures that decisions are well-rounded and consider the diverse perspectives and expertise of each member. By working together, the Top Management can make informed choices that benefit the organization as a whole.

A4.4.6 Full Kit Manager

Responsibility:

In the realm of critical chain multi project management, the role of the Full Kit Manager is crucial. This expert is responsible for providing support to project applicants in the development of project briefs, also known as chartas. The main objective is to ensure that new projects are prepared and planned in a manner that allows for safe and efficient management. By doing so, the Full Kit Manager aims to minimize surprises and complications that may arise during the project due to missing information.

To fulfill this responsibility, the Full Kit Manager takes certain tasks into consideration. One of these tasks involves securing knowledge about good project plans, which can be achieved through the use of checklists. By having access to these checklists, the Full Kit Manager can ensure that all necessary elements are included in the project plan, reducing the likelihood of overlooking important details.

Additionally, the Full Kit Manager plays a crucial role in preventing unnecessary energy from being expended during project preparation. This is important because excessive focus on certain aspects of the project can lead to missed opportunities. By carefully managing the preparation process, the Full Kit Manager ensures that resources are allocated efficiently and that all necessary steps are taken without wasting valuable time and effort.

Disclaimer:

It is important to note that the role of the Full Kit Manager may not be present in all project implementations. While this position is highly recommended for effective project management, it is not explicitly installed in every case. In situations where the Full Kit Manager is not designated, the responsibilities associated with this role are typically fulfilled by the Pipeline Manager.

In conclusion, the Full Kit Manager plays a vital role in critical chain multi project management. Their responsibilities include supporting project applicants in the development of project briefs, ensuring that new projects are prepared and planned effectively. By securing knowledge about good project plans and preventing unnecessary energy expenditure, the Full Kit Manager contributes to the successful execution of projects. However, it is important to acknowledge that the presence of a Full Kit Manager may vary depending on the specific project implementation, with the Pipeline Manager often assuming these responsibilities in their absence.

A4.5 Relay Runner Principle

The Relay Runner Principle is a concept used in project management, specifically in the context of the critical chain approach. The critical chain refers to the sequence of tasks or activities that determine the overall duration of the project. These tasks are often interdependent, meaning that the completion of one task is necessary for the start or continuation of another. The critical chain represents the longest path of tasks, and any delay in this chain will directly impact the project's timeline.

The Relay Runner Principle is about maintaining a constant and efficient flow of work along the critical chain. It draws inspiration from a relay race, where a team of runners passes a baton from one runner to another in order to complete the race. The goal of the relay race is to win, and each runner runs their leg as fast as possible before handing off the baton to the next runner.

In project management, the Relay Runner Principle emphasizes the importance of ensuring that the critical chain is never stopped or delayed. To achieve this, project managers should allocate the maximum effective number of resources to the projects. Instead of thinly spreading resources across multiple tasks and projects, it is crucial to concentrate resources on the critical chain. This means that the resources should be dedicated to completing the tasks in the critical chain as quickly as possible.

By following the Relay Runner Principle, project teams can maintain a constant running speed along the critical chain, just like relay runners passing the baton smoothly. This principle helps to minimize delays and bottlenecks, ensuring that the project progresses efficiently.

In high-speed projects, where time is of the essence, the Relay Runner Principle becomes even more crucial. The critical chain is the backbone of such projects, and any delay or disruption in this chain can have significant consequences for the overall timeline.

Therefore, project teams need to adopt the Relay Runner Principle as part of their culture. They should prioritize the critical chain, allocate resources accordingly, and ensure that the flow of work is maintained without interruptions. This principle promotes a sense of urgency, efficiency, and collaboration among team members, ultimately leading to successful and timely project completion.

In summary, the Relay Runner Principle in project management is about maintaining a constant and efficient flow of work along the critical chain. It emphasizes the importance of allocating resources effectively, focusing on speed and efficiency, and ensuring that the critical chain is never stopped or delayed. By following this principle, project teams can achieve high-speed projects and meet their deadlines effectively.

A4.6 Dashboard

In critical chain multi project management (CCPM) organizations, a dashboard plays a crucial role in monitoring and analyzing key performance indicators (KPIs). One important chart that can be included in the dashboard is the "Over the line" chart, which tracks the throughput and operating expenses over time. This chart provides a visual representation of how these metrics are performing and allows for easy identification of any trends or anomalies.

Another important KPI to consider is the due date reliability. This metric measures the relative number of projects that are finished within their designated timeframes. By tracking this KPI, organizations can assess their ability to meet project deadlines consistently and identify any areas for improvement.

Throughput is another essential KPI that should be included in the dashboard. It measures both the number of active tasks and the number of finished tasks. By monitoring throughput, organizations can gain insights into their project progress and identify any bottlenecks or areas where tasks are getting delayed.

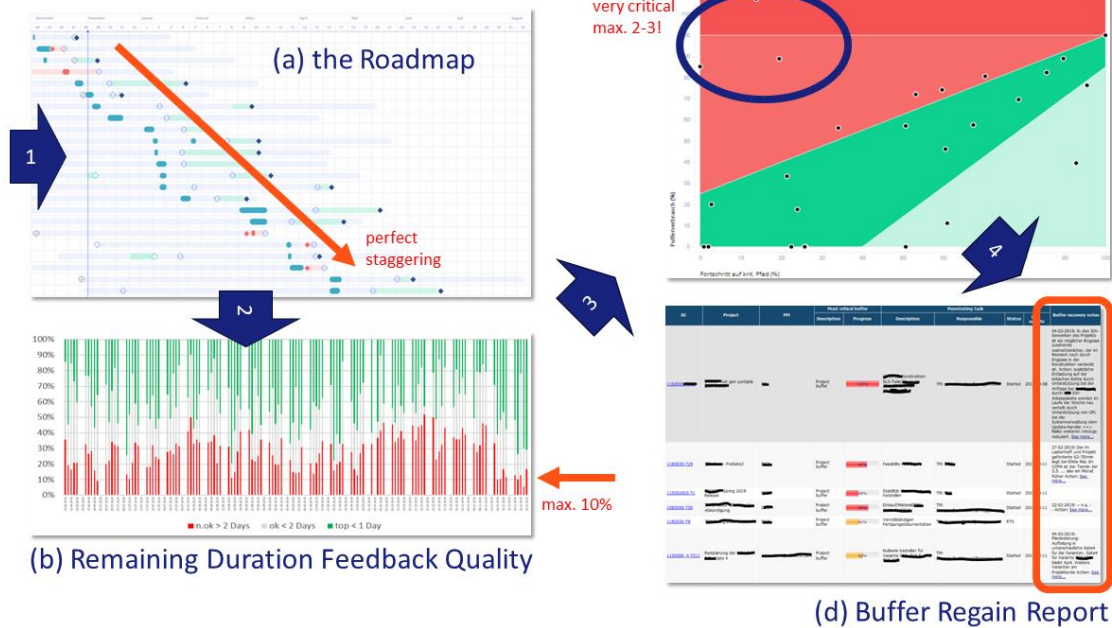
The dashboard should also include information on the relative number of black and red projects. Black projects are those that have consumed all of their buffer and are unable to meet the due date. On the other hand, red projects are at risk of not meeting the due date as their buffer consumption exceeds their progress. By tracking the relative number of black and red projects, organizations can identify projects that require immediate attention and implement buffer regain measures if necessary.

Additionally, the dashboard should provide insights into the relative feedback rate for "remaining duration" given within a day. This metric measures how quickly feedback is provided on the estimated remaining duration of tasks. A high feedback rate indicates effective communication and collaboration within the organization, enabling timely adjustments to project plans.

Lastly, the dashboard should include information on the work-in-progress (WIP) and the relative load of the bottleneck and bottleneck-related resource groups. By monitoring the WIP and the load on bottleneck resources, organizations can identify areas where resources are being overutilized or underutilized. This information can help in optimizing resource allocation and improving overall project efficiency.

In summary, a well-designed dashboard for CCPM organizations should include KPIs such as the "Over the line" chart, due date reliability, throughput, relative number of black and red projects, feedback rate for remaining duration, and WIP. By regularly monitoring these metrics, organizations can gain valuable insights into their project performance, identify areas for improvement, and make data-driven decisions to enhance their overall project management effectiveness.

“CCPM Management Cockpit” ...



Example of a typical CCPM Cockpit: (a) the Roadmap with perfect staggered, (b) the Quality of the Estimated Time To Completion Feedbacks, (c) the Portfolio Overview/Scatter Plot, and (d) the reporting on the Buffer Regain Measures

A5 Learning as Fast as Possible

A running CCPM-Software is an invaluable tool for a critical chain multi project management expert like myself. It allows us to quickly gather and analyze data, providing us with the necessary information to make informed decisions and improve the system. One of the key insights we gain from this data is the identification of projects that consume a significant amount of buffer. This knowledge is crucial as it directs our focus towards areas that require continuous improvement actions with a high potential for positive impact.

It is important to note that at least half of the increase in throughput achieved during the implementation of CCPM is a result of continuous improvement measures. This highlights the significance of the CIP (Continuous Improvement Process) in maximizing the benefits of CCPM.

CIP Loop 1 focuses on the buffer consumption of individual projects. By closely monitoring the buffer consumption, we gain valuable insights into the areas within the project that require improvement. This allows us to identify where and how we can make up for lost time and get the project back on track. Through this iterative process, we continuously learn and adapt, ensuring that we are constantly improving our project execution.

CIP Loop 2 takes a broader perspective by analyzing the project portfolio as a whole. By examining multiple projects, we can identify patterns and trends in time loss across the organization. This enables us to develop solutions at an organizational level, addressing systemic issues that may be hindering project performance. By learning from all the projects, we can implement changes that have a far-reaching impact, improving overall efficiency and effectiveness.

In conclusion, learning as fast as possible is essential in the world of critical chain multi project management. The use of a running CCPM-Software allows us to gather and analyze data, providing us with valuable insights for continuous improvement. Through CIP Loop 1, we focus on individual projects, identifying areas for improvement and taking corrective actions. CIP Loop 2 takes a broader perspective, analyzing the project portfolio to identify systemic issues and develop organizational-level solutions. By continuously learning and adapting, we can maximize the benefits of CCPM and drive success in our projects.

A5.1 Stabilize CCPM Methods and Tools

In the world of critical chain multi project management (CCPM), stabilizing methods and tools is crucial for successful project execution. One important aspect of this is the continuous improvement process (CIP) loop 1, which specifically focuses on project-oriented buffer regain.

During the start phase of implementing CCPM, analyzing the buffer consumption becomes essential. This analysis helps in cleaning up the project plans and ensuring that they are controllable. By identifying the factors that consume the buffer, project managers can make valuable single improvements within the projects.

The goal of CIP loop 1 is to regain control over the buffer and ensure that it is used effectively. This process involves closely monitoring the buffer and identifying any unfavorable variability. By doing so, project managers can take proactive measures to address potential issues and prevent delays.

Analyzing the buffer consumption also helps in identifying areas where improvements can be made. By understanding how the buffer is being utilized, project managers can make informed decisions about resource allocation and task prioritization. This leads to more efficient project planning and execution.

The implementation of CIP loop 1 requires a mindset that values continuous improvement and a willingness to adapt and make changes as needed. It is important to regularly review and analyze the buffer consumption to identify areas for improvement. This process should be integrated into the project management practices to ensure that projects stay on track and meet their deadlines.

Overall, CIP loop 1 in CCPM is a valuable tool for stabilizing project execution. By focusing on project-oriented buffer regain, project managers can identify and address issues that may arise during the project lifecycle. This continuous improvement process leads to more efficient and successful project outcomes.

A5.2 FIP- Focused Improvement Process

In the focused improvement process (FIP), we aim to address the root causes of issues and improve the performance of our organization. One important aspect of FIP is the CIP loop 2, which focuses on learning from our previous improvement efforts and continuously improving our processes.

By implementing CIP measures at the bottleneck, which is often the critical chain in project management, and at the constraint, which is the system bottleneck, we can identify and eliminate buffer eaters. Statistical methods are used to examine the pipeline manager, who is often the process owner, and process improvements are implemented using the Deming Circle plan, do, check, act.

It is important to approach the constraint in a careful manner to ensure that it does not unintentionally move. If the constraint does move, we need to first carry out improvement measures on constraint-like processes and increase their performance before continuing at the constraint again.

It is worth noting that the root cause for the restriction is not always located at the constraint or on the critical chain. Sometimes, the effects of the root causes are felt at these points. For example, if the assembly of a plant is on the critical chain and consistently takes longer than planned, the root causes may be incomplete deliveries, such as missing documents or untested and faulty subassemblies.

To effectively address these issues, it is crucial to have the support and involvement of top management. The logbook becomes the most important document in the company, as it helps us track and address structural root causes. Through timely transparency and a unified operational priority for all initiatives, we can ensure that the FIP is implemented successfully.

In conclusion, the focused improvement process (FIP) is a systematic approach to address the root causes of issues and improve the performance of our organization. By implementing CIP measures at the bottleneck and constraint, and involving top management, we can effectively eliminate buffer eaters and improve our processes. The logbook becomes a valuable tool in tracking and addressing structural root causes, leading to continuous improvement and success.

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S CCPM Summary

In the previous chapter, we delved into the intricacies of Critical Chain Project Management (CCPM). Now, let's take a step back and provide a summary of what CCPM entails, as well as the success factors that have emerged from over 50 successful implementations.

CCPM is a powerful project management approach that goes beyond simply aggregating safety time. It encompasses three core principles that are essential for its successful implementation. These principles serve as the foundation for making your portfolio and project management more agile by combining CCPM with the power of agile methods at the team level.

While agile concepts often thrive within small teams and single product environments, larger projects or organizations face the challenge of managing multiple teams and projects simultaneously. This is where CCPM comes into play, offering a solution to make your project management more agile on a larger scale.

To achieve something great or on a large scale, it becomes necessary to work with numerous internal teams and external partners. CCPM provides the key to delivering projects faster, at lower costs, and with greater predictability. By implementing CCPM, organizations like Amdocs, a B2B software company, have witnessed significant improvements in project productivity and quality.

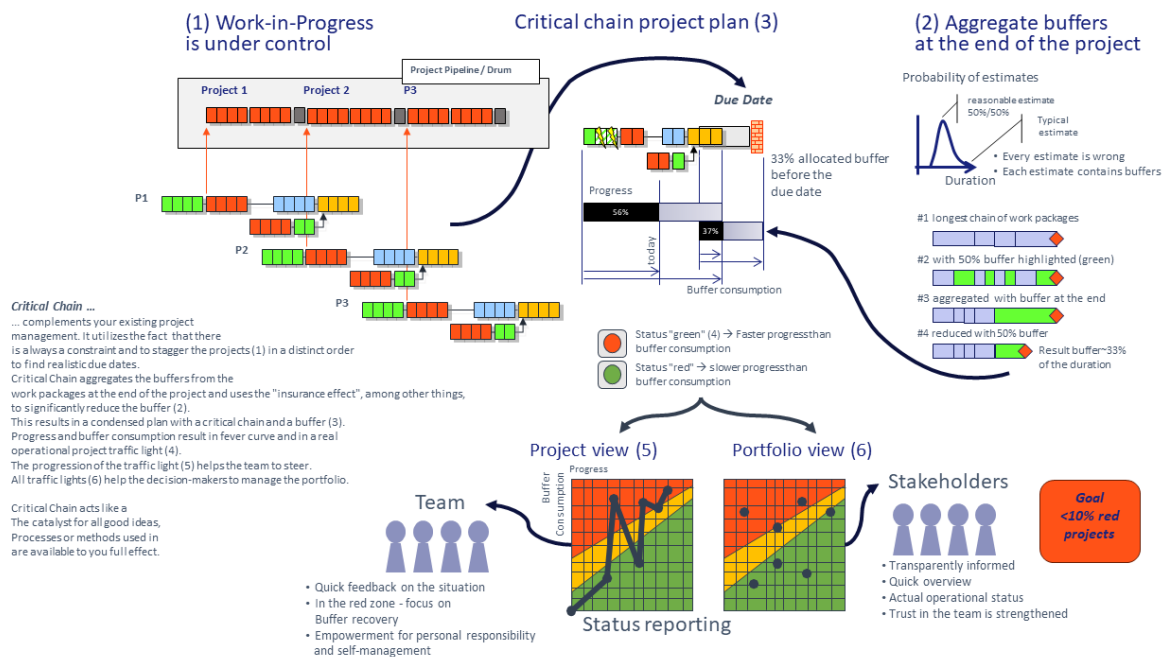
However, implementing CCPM is not without its challenges. While most success stories have been observed in projects where the majority of the team works for a single organization, it becomes more complex when contractors are involved, as is often the case with capex projects. Exploiting CCPM in such scenarios requires careful management and collaboration among the project team.

CCPM is proven to deliver a step-change improvement in project performance across various industries. It consists of two fundamental pillars: planning and managing projects using CCPM, and selecting and contracting with the most important project contractors/suppliers through a Project Alliance. Both elements are crucial for the success of Breakthrough PM, and their absence can make implementation challenging and time-consuming.

In addition to CCPM, there are other project improvement techniques that can complement its effectiveness. These techniques, when combined with CCPM and Project Alliancing, can produce remarkable results. The next section will explore these techniques in more detail, providing insights into how they align with CCPM and enhance project management.

In conclusion, CCPM is a comprehensive project management approach that offers a solution for managing multiple teams and projects in larger organizations. By combining CCPM with agile methods at the team level, organizations can achieve greater agility and deliver projects faster, at lower costs, and with improved predictability. The success factors distilled from numerous implementations highlight the importance of careful planning, collaborative contracting, and effective project management techniques.

S1 In a Nutshell"



Critical Chain Project Management on one Page

In the world of critical chain multi project management, one of the key challenges is managing the work in progress (WIP) and resource usage. It is easy to fall into the trap of having too much WIP, which can lead to inefficiencies and delays. To break this cycle, it is important to identify the bottleneck in the system and stagger the projects accordingly. By doing so, we can ensure that the constraint is not overloaded and resources are distributed optimally.

To ensure good preparation and reduce effort in the constraint, it is crucial to define a responsible person who will oversee the preparation of projects. This includes ensuring that work packages are well-prepared before they enter the constraint. By doing so, we can minimize the chances of encountering unexpected issues and delays in the execution phase.

Traditional project planning often suffers from estimations and wrong assumptions. The "student-syndrom" and Parkinson's Law can lead to unrealistic expectations and delays. To address this problem, we need to fix the planning process by incorporating buffers into the project plan. These buffers, such as project buffers and integration buffers, allow for unforeseen events and provide flexibility in meeting deadlines. Additionally, milestones can be both helpful and detrimental, so careful consideration is needed when incorporating them into the project plan.

Execution is a critical aspect of CCPM, and priorities play a significant role in ensuring smooth operations. Operative priorities are necessary to guide the team in making decisions and allocating resources effectively. In CCPM-controlled environments, control structures are put in place to ensure that the project plan is followed and progress is monitored. Roles such as the Project Manager, Resource Manager, Task Manager, Pipeline Manager, and Decision Maker are designed specifically for CCPM projects. The relay runner principle is applied, where tasks are handed over from one team member to another, ensuring a smooth flow of work. Dashboards are used to provide a visual representation of the project's progress and help in decision-making.

Learning is a continuous process in CCPM, and it is essential to stabilize the methods and tools used. The Focused Improvement Process (FIP) is implemented to analyze the buffer consumption and

identify areas for improvement. Buffer regain measures are taken to ensure that the ratio of red projects (projects at risk of missing deadlines) is below 15%. By learning from each project and implementing improvements step-by-step, we can continuously enhance our processes and achieve better results.

In conclusion, critical chain multi project management requires careful management of WIP and resource usage, good preparation, effective project planning, efficient execution, and continuous learning. By implementing these key ideas, we can optimize project performance, meet deadlines, and deliver successful outcomes.

S2 Success Factors

The core problem that often arises in project management is local optimization. Each department or team focuses on maximizing their own efficiency without considering the impact on the overall project. This leads to bottlenecks and delays, as resources are not allocated effectively and projects are not prioritized correctly.

The solution to this problem is to decide locally but act globally. This means looking at all projects at once and identifying the constraint, the area or process that is limiting the overall flow of work. By staggering projects according to their strategic priority at the constraint, we can ensure that it is never overloaded or underloaded. This optimal flow allows for fast output and ensures that resources are not waiting for work.

To achieve this, every project must have a clear understanding of its "criticality." This is derived from the progress versus buffer consumption, which indicates how close the project is to its deadline. This information is used to adjust resource allocation and ensure reliable delivery. By having one signal for all projects, we can generate synchronous working and avoid unnecessary delays.

In order to maintain trust in the project status, it is crucial to have a daily feedback system. This includes providing feedback on the remaining duration of all open work packages and calculating the fever curve, which shows the buffer status. This information is used to allocate resources and make informed decisions. By adhering strictly to the red-yellow-green status, we can ensure that project plans are realistic and useful.

Another important aspect of successful project management is continuous improvement. By analyzing the buffer consumers, the projects that are consuming the most buffer, we can identify root causes of process problems and focus on improving them. This focused kaizen approach allows for daily process improvements and sharpens the axe, reducing project lead times and ensuring that process problems occur and can be solved.

To implement these success factors, it is crucial to underload the organization. This means ensuring that people have enough protective capacity to handle disruptions and solve problems effectively. By providing enough resources and support, we can create an environment where teams can work efficiently and deliver high-quality results.

Overall, by implementing these key ideas, we can overcome the challenges of local optimization and achieve success in project management. By looking at the big picture, providing clear signals, and continuously improving processes, we can ensure that projects are delivered on time and with high quality.

B Deep Dives

In the previous part of this book, we covered the essential topics of critical chain multi project management in a practical and hands-on manner. However, in this chapter, we will take a deeper dive into several specific topics and explore the background behind them.

The purpose of this chapter is to provide a more detailed understanding of these topics and shed light on the underlying principles. By delving into the intricacies of critical chain multi project management, we aim to equip you with a comprehensive knowledge that goes beyond the surface level.

Throughout this chapter, we will explore various aspects of critical chain multi project management, examining the theories and concepts that underpin its effectiveness. By gaining a deeper understanding of these topics, you will be better equipped to implement and utilize critical chain multi project management strategies in your own organization.

It is important to note that this chapter does not provide a step-by-step guide or a one-size-fits-all solution. Instead, it aims to provide you with the necessary knowledge and insights to make informed decisions and adapt critical chain multi project management principles to suit your specific needs and circumstances.

By exploring these topics in more detail, we hope to empower you with the knowledge and understanding to effectively implement critical chain multi project management in your organization. This chapter serves as a valuable resource for those seeking a deeper understanding of the principles and practices that drive hyper-productivity and success in project management.

In conclusion, this chapter serves as a bridge between the foundational knowledge covered in the previous part of the book and the practical application of critical chain multi project management. By delving into these topics in more detail, we aim to provide you with a comprehensive understanding that will enable you to make informed decisions and drive success in your organization.

B1 Physics of Flow

In this chapter, we delve into the fascinating world of the physics of flow. We aim to shed light on the underlying laws that govern the movement and efficiency of work within organizations. These laws have been observed and validated through the experiences of countless companies that have grappled with the challenges of excessive work in progress (WIP).

One of the fundamental laws we explore is known as Little's Law, which is often referred to as the law of time. Little's Law provides us with a mathematical understanding of lead time, or the time it takes for a project, initiative, or order to be completed. It states that the average number of customers or work items in a system is equal to the average arrival rate multiplied by the average time spent in the system. In practical terms, this means that lead time can be calculated by dividing the work in process (WIP) by the throughput.

Little's Law is particularly valuable in stable systems where the inflow and outflow of work are balanced. By reducing the WIP to its lowest possible level without disrupting the flow, we can effectively decrease the lead time and allow for a smoother and more efficient process. This reduction in WIP also tends to minimize mistakes, negative multitasking, and flow disruptions, ultimately leading to higher throughput.

Another important law we explore is Goldratt's Law, also known as the law of throughput. This law, derived from the Theory of Constraints, focuses on the rate at which work is completed within a system. It emphasizes the importance of identifying and addressing bottlenecks or constraints that hinder the flow of work. By optimizing the throughput, organizations can achieve higher levels of productivity and performance.

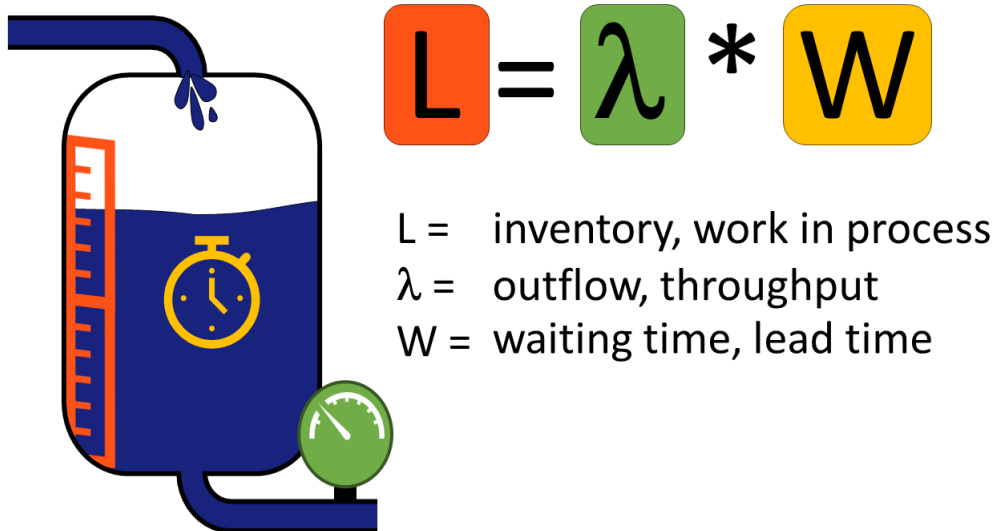
Understanding these laws is crucial for managers and professionals in their pursuit of effective project and process management. By applying the principles of Little's Law and Goldratt's Law, we can gain insights into how to speed up time-to-market and improve overall efficiency. These laws are not mere theoretical concepts but scientifically proven principles that can be validated by anyone, regardless of their beliefs.

As we delve deeper into the topic, we also explore the impact of these laws on agility and the reduction of inventory in knowledge work. Little's Law, in particular, plays a significant role in agile methodologies such as Kanban, where it is utilized in a probabilistic manner. The Theory of Constraints also relies on Little's Law in a deterministic fashion for operations management.

Reducing WIP in knowledge work is crucial for enabling flow, which in turn leads to stellar financial performance. High levels of WIP render planning and estimating efforts futile, as the passage of time becomes increasingly unpredictable. By embracing the principles of Little's Law and Goldratt's Law, organizations can effectively reduce WIP, shorten lead times, and achieve greater levels of efficiency and success.

In conclusion, the physics of flow provides us with valuable insights into the dynamics of work within organizations. Little's Law and Goldratt's Law serve as guiding principles for optimizing lead time and throughput, respectively. By understanding and applying these laws, managers and professionals can navigate the complexities of project and process management with greater efficiency and success.

B1.1 Little's Law



A graphical explanation of Little's Law. We use it as Lead Time = Work in Process divided by Throughput

According to Little's Law, the lead time of a work package is directly proportional to the number of work packages in the system. The formula for this law is average lead time = average WIP / average throughput. To understand this concept, let's consider the cash-out process at a supermarket. When there is only one customer at the cash-out, the lead time for the payment process is very short. However, as more customers join the queue, the cash-out process takes longer for each customer. The lead time for each customer is a combination of the actual processing time and the waiting time in the queue.

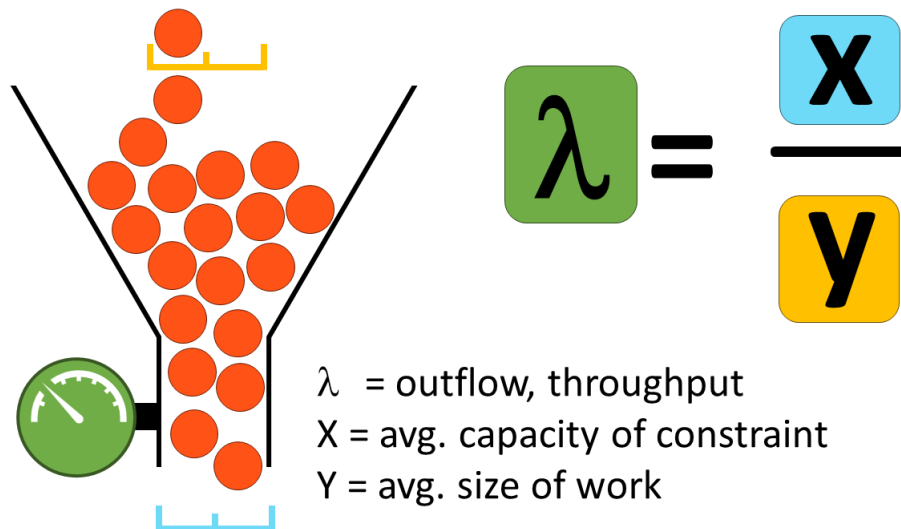
To achieve a shorter lead time, it is crucial to minimize the amount of work in the system. This means that there should not be too many work packages waiting to be processed. If we want to reduce the time to market by half, the key is to reduce the work in process (WIP) by half. This means that we need to ensure that there are fewer work packages in the system at any given time.

Managers have a strong argument for reducing WIP because it leads to immediate improvements in lead time. By reducing the amount of work in process, the flow of work becomes smoother and more efficient. This results in shorter lead times and faster time to market. Additionally, reducing WIP often leads to a decrease in mistakes, negative multitasking, and flow disruptions. These improvements ultimately lead to higher throughput, which is the rate at which work is completed.

The effect of reducing WIP can be compared to an afterburner. Just as an afterburner provides an extra boost of power to an aircraft, reducing WIP provides a significant boost to the flow of work. When WIP is reduced, lead time decreases and throughput increases. This immediate improvement in flow allows for faster and more efficient completion of work packages.

In summary, Little's Law teaches us that the lead time of a work package is influenced by the amount of work in process. By reducing WIP, managers can significantly improve lead time and time to market. This reduction in WIP leads to smoother flow, fewer mistakes, and higher throughput. It is like adding an afterburner to the process, providing a powerful boost to the efficiency and speed of completing work packages.

B1.2 Goldratt's Law



A graphical explanation of Goldratt's Law. We use it as Throughput = average Capacity of the Constraint divided by average effort in the Constraint

The concept of throughput in a system is crucial for understanding its overall performance. According to Goldratt's Law, the average throughput of a system can be determined by dividing the average capacity in the constraint by the average effort required in the constraint. This law emphasizes the importance of closely examining the capacity and effort within the constraint of a company's operations.

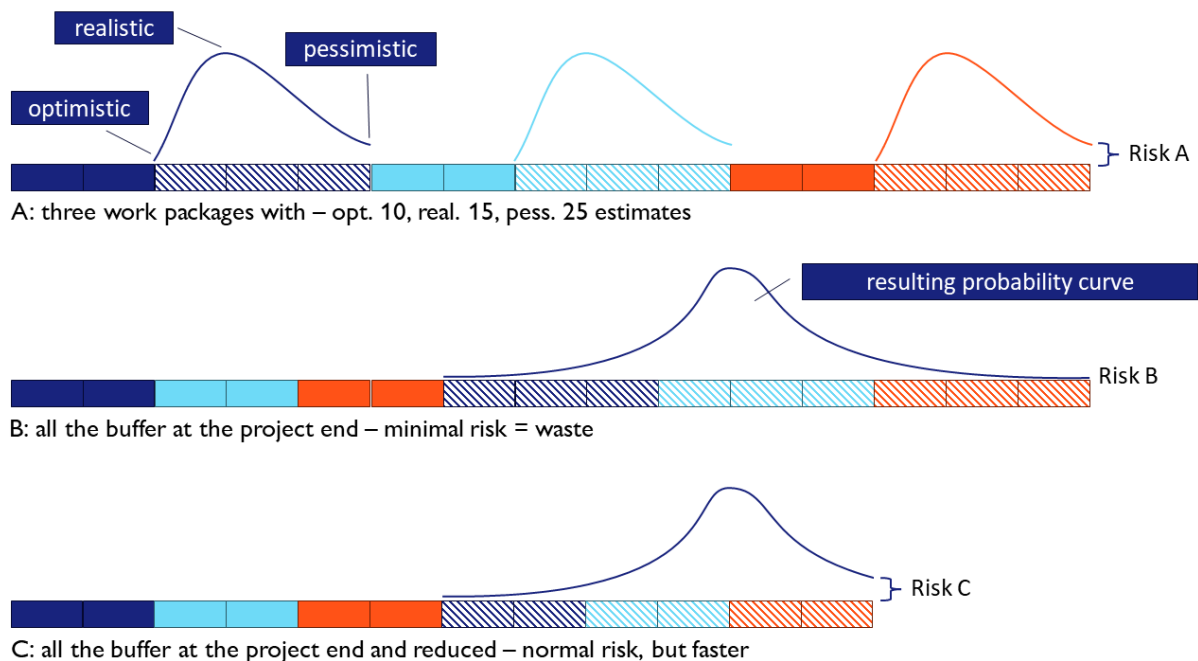
To effectively apply Goldratt's Law, companies must pay attention to the capacity within the constraint and the actual time and effort it takes to process a work package or item. By analyzing these factors, organizations can gain insights into the efficiency and productivity of their operations.

One key aspect highlighted by Goldratt's Law is the need to minimize waiting times within the constraint. This can occur when workers are occupied with other tasks or when work packages are left waiting to be processed. To ensure that Goldratt's Law is effective, companies must either eliminate these waiting times or reduce the capacity of the constraints to accommodate them.

By focusing on the constraint and optimizing its capacity and effort, companies can improve their overall throughput. This means that they can generate goal units at a faster rate and achieve their desired outcomes more efficiently. Goldratt's Law provides a framework for organizations to identify and address the factors that limit their throughput, ultimately leading to improved performance and profitability.

In summary, Goldratt's Law emphasizes the significance of the constraint in determining the throughput of a system. By closely examining the capacity and effort within the constraint, companies can identify areas for improvement and optimize their operations. Minimizing waiting times within the constraint is essential for maximizing throughput and achieving desired outcomes. Applying Goldratt's Law can help organizations enhance their overall performance and drive success in their operations.

B1.3 The Math Behind Estimations



Introduction into the math of probability curves to use in estimations in projects: A shows three work packages with their buffer under the probability curve and the remaining risk; B shows aggregating the buffers at the end, which leads to minimal risk; C shows reduced buffer, leading to shorter projects with reasonable risk

In order to calculate the probability of success in a project, it is important to understand the distribution function of estimations. This function represents the relative probability of meeting a deadline or effort. It consists of three values: the optimistic value (O), the realistic value (R), and the pessimistic value (P).

The optimistic value represents the best-case scenario, where everything runs smoothly and the project is completed without any issues. This value cannot be undershot under any circumstances. On the other hand, the pessimistic value represents the worst-case scenario, where everything goes wrong and the project faces numerous challenges. This value is relatively improbable and approaches zero as it gets closer to the X-axis.

In between the optimistic and pessimistic values lies the realistic value, which is the most likely outcome. This results in an asymmetric probability distribution. To simplify the calculation, this distribution can be approximated using two triangles. By doing so, one can calculate the absolute probability (area under the curve) for each value or vice versa.

When it comes to project planning, the value with 50% absolute probability is usually used. This value is obtained by taking the sum of the 50% values of the absolute probabilities of the individual work packages. This approach allows for the balancing of early and late work arrivals.

In a project environment where there is a lot of pressure or work-in-progress, resource managers tend to provide pessimistic estimates for their own safety. Even in an environment where clients are risk-averse, estimates tend to be pessimistic. As a result, estimates often come close to the 95% absolute probability, which is twice as large in value as the 50% value.

To calculate the probability of success over time, the probability curves can be convolved. This results in the relative probability of success over time. By integrating the curve, one can obtain the absolute probability of success over time or at least get an idea of it. From experience, it is known that aiming

for a 100% probability of success is unrealistic and costly. A probability of around 80% is considered acceptable and provides a realistic chance of success.

To achieve a balanced backlog, velocity, and due-date, it is important to communicate and negotiate with the product owner and stakeholders. This may involve reducing the number of stories in the backlog, allocating more resources, or adjusting the due-date by changing the number of sprints. This collaborative effort ensures a realistic probability of success for the team and the release.

In conclusion, understanding the distribution function of estimations and selecting the appropriate value for project planning is crucial for determining the probability of success. By considering the optimistic, realistic, and pessimistic values, and taking into account the specific project environment, a balanced approach can be achieved. This allows for a realistic chance of success and ensures effective project management.

B2 From Bottleneck to Constraint

Constraints play a crucial role in project management, as they provide valuable insights and help make strategic decisions. Unlike bottlenecks, which hinder the smooth flow of work, constraints are the key areas that need to be actively managed. It is important to understand and appreciate the value of constraints in order to optimize project performance.

Bottlenecks, on the other hand, are real, local, or temporary constraints that prevent the best utilization of the main constraint. They create congestion and hinder the flow of work, leading to delays and inefficiencies. It is essential to identify and eliminate bottlenecks as quickly as possible to ensure smooth project execution.

As a critical chain multi-project management expert, my focus is on identifying and managing constraints effectively. Constraints provide a clear direction for decision-making and resource allocation. By actively managing the constraint, we can align the project flow and eliminate negative multitasking or congestion.

While bottlenecks may arise during the project, they should not be confused with constraints. Bottlenecks are obstacles that need to be addressed promptly to ensure optimal utilization of the constraint. By resolving bottlenecks, we can ensure that work flows smoothly and efficiently, maximizing project throughput.

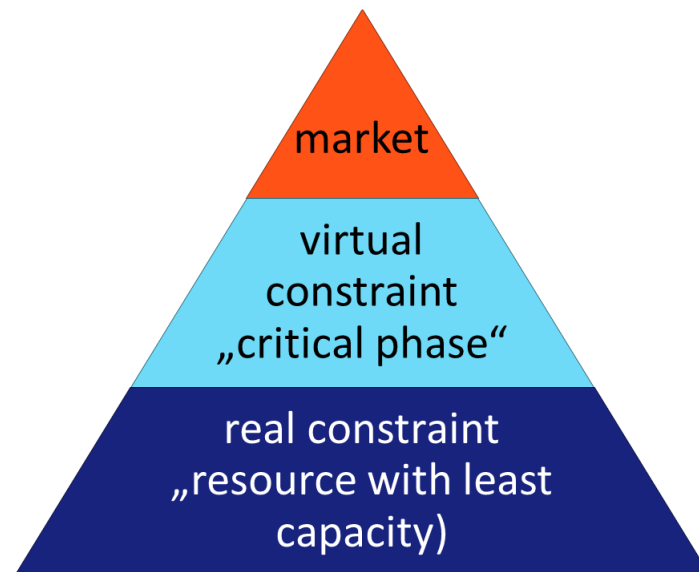
In the world of knowledge-based organizations, the Theory of Constraints serves as a catalyst for continuous performance improvement. It helps organizations understand the nature of constraints and provides tools like Drum-Buffer-Rope scheduling and Critical-Chain buffer management to enhance project management methodologies like Scrum.

Constraints are not constantly shifting, as commonly believed. By limiting their capacity and taking targeted actions with throughput, investments, and operating expenses, we can pin down and manage constraints effectively. The Buffer Fever Chart is a fantastic tool that brings project attributes to a relative scale, aiding in constraint management.

To achieve a hyper-productive organization, it is important to understand the main features that characterize it. Part I of this book delves into these features, including patterns and pattern languages. While patterns may not be of interest to everyone, they provide valuable insights into organizational change and flow of work.

In conclusion, constraints are valuable assets in project management, providing direction and aiding in decision-making. It is important to differentiate between constraints and bottlenecks, actively managing the former while swiftly addressing the latter. By embracing constraints and eliminating bottlenecks, we can ensure smooth project execution and maximize performance.

B2.1 Abstractions of Constraints



Different abstractions of constraints - from real constraints (bottom), virtual constraints (in the middle) to market constraints at the top

In the realm of project management, constraints play a crucial role in determining the success of a project. However, the nature of constraints differs between production-based work and knowledge-based work or projects. In production, real constraints are typically clear and tangible, such as limited resources or time. These constraints can be identified and addressed directly.

On the other hand, in knowledge work or projects, the variability and unpredictability of resources and estimates make it challenging to fix constraints at a resource level. This is where the concept of virtual constraints comes into play. Virtual constraints are more abstract and represent the critical phases or activities in a project where the best minds and expertise are required.

One such phase is the integration phase, where various components or elements of a project come together for the first time. This phase is of utmost importance and requires the collaboration of experienced individuals and top management representatives. Due to the complexity and uniqueness of this phase, it is often used as the virtual constraint in project environments. The integration phase serves as a bottleneck, as there will never be enough experienced people to eliminate this constraint entirely.

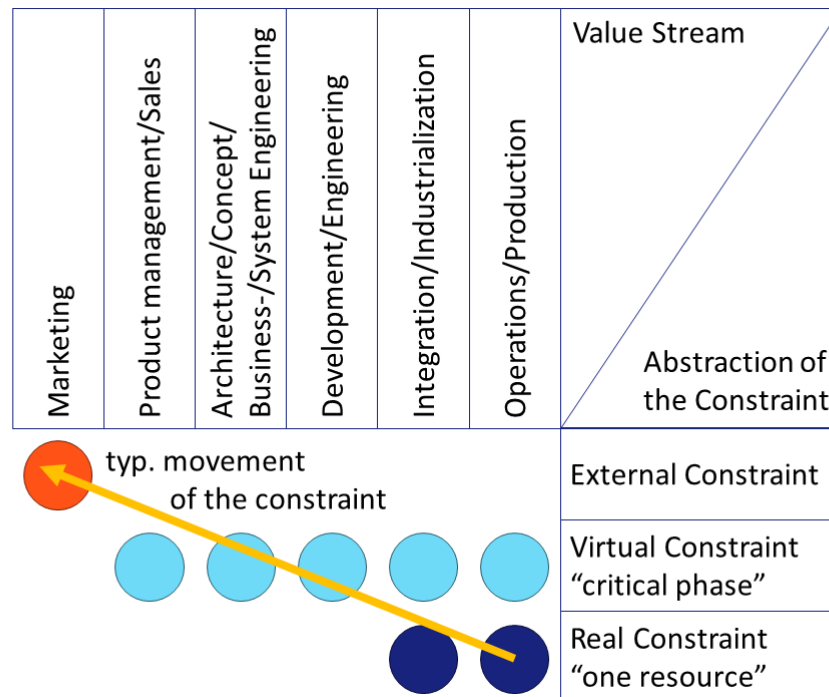
Unlike real constraints, virtual constraints are not tied to specific resources but rather represent critical periods or tasks that require specialized skills and knowledge. These constraints are referred to as virtual drums, as they set the pace and capacity for the project. Managing the virtual drum effectively ensures that the constraint is not overloaded, multitasking is minimized, and resources are not overwhelmed.

In the context of multi-project management, identifying and utilizing the virtual drum becomes crucial for increasing overall productivity. The goal is to optimize the use of the company's constraint, whether it is a real or virtual constraint. However, in knowledge work or project environments, the identification of the virtual drum is not an easy task. The availability of resources fluctuates, and estimates are unstable, making it challenging to fix the constraint at a resource level.

Despite these challenges, the integration phase remains a critical period in all projects. It is during this phase that the feeding chains come together, and the product is integrated and tested for the first time. The integration phase serves as a virtual constraint due to the need for the best people to

handle it. The expertise and experience required for this phase are often in high demand and limited supply, making it an ideal candidate for the virtual drum.

In summary, the concept of virtual constraints is essential in knowledge work or project environments where real constraints are difficult to fix at a resource level. The integration phase, where critical minds collaborate to find the best concepts or solutions, often serves as the virtual constraint. By effectively managing the virtual drum, multitasking can be minimized, resources can be optimized, and overall project productivity can be increased.



Most companies suffer from real constraints in the beginning - this graphic shows the typical way constraints move from real to more abstract and upstream in the value stream

B2.2 Where the Constraint Should Be

In the world of project management, the ultimate goal is to have the constraint positioned exactly where we want it. This means that we strive to drive the constraint out of the organization and push it further upstream into the sales and marketing departments, and ultimately into the market itself. As a critical chain multi-project management expert, I understand the importance of this concept and how it can greatly impact the overall performance and success of an organization.

The idea behind driving the constraint out of the organization is to ensure that it does not hinder the flow of value to our clients. By positioning the constraint further upstream, we can better exploit it and subordinate the rest of the organization to its needs. This means that we focus our efforts on maximizing the output and efficiency of the constraint, while aligning the other departments and processes to support and enhance its performance.

Initially, the constraint may exist within the organization itself, such as in the production or assembly line. In this case, we work towards improving the constraint's performance and efficiency, but our ultimate goal is to shift it towards the sales and marketing departments. This is because the market itself is often the ultimate constraint that limits the flow of value to our clients. By positioning the constraint in the market, we can better understand and respond to the needs and demands of our customers, ultimately increasing our sales and overall success.

The process of driving the constraint out of the organization and into the market is not an easy task. It requires careful analysis, planning, and implementation. We must identify the current constraint within the organization and work towards improving its performance. Simultaneously, we must also focus on developing our sales and marketing strategies to ensure that they are aligned with the needs and demands of the market.

As a critical chain multi-project management expert, I understand that this process requires a holistic approach. It involves not only improving the performance of the constraint but also aligning the entire organization to support and enhance its performance. This means that we must actively manage the constraint, cooperate with other departments, and ensure that everyone understands the urgency and importance of the constraint's role in driving the organization's success.

In conclusion, the goal of driving the constraint out of the organization and into the market is a crucial aspect of effective project management. As a critical chain multi-project management expert, I am well-versed in the strategies and techniques required to achieve this goal. By positioning the constraint further upstream, we can better exploit its potential and subordinate the rest of the organization to its needs. This ultimately leads to increased sales, improved efficiency, and overall success for the organization.

B2.3 Typical Organizations and Their Constraints

| | Class of System (examples) | Typical Constraint | Examples of Constraints |
|---|--|---|---|
|  | Production line for parts screws, batteries | The workstation with the longest cycle time (often physically determined process/capacity) | Heat treatment (oven), press, or extruder |
|  | Products with high quality sensorics properties olive oil or colors production | The tester who is able to smell or see the difference | Olive oil expert, sommelier or color expert |
|  | Make to Order mobile phones, cars | The point where two/more feeding lines come together - often assembly | The "marriage" in car manufacturing or final assembly in end-products |
|  | Job-Shop – complex production networks with changing production paths and high variance orders special chemistry, analysis, pharmacies | The experts who can use the machines – often the flexible experts who can use more than one machine | Job release |
|  | Engineering to Order special machinery, plant engineering | Engineering, long experienced process experts | Experienced engineers, group of engineers or plant start up manager |
|  | Multi project (product development) component producer, IT product companies | The integration phase when the product is made ready for mass production | Industrialization |
|  | Multi project (service) consulting companies, agencies | The phase of delivery and start-up with the end customer | Delivery or System/Solution Engineering |
|  | Agile Multi Project with running Continuous Integration/Delivery mature agile IT companies | The creative idea generation in the beginning on how to use the existing system optimally | Business Engineering, Enterprise Architecture |
|  | Value Stream oriented Organizations App-Environments | the creative part where the system itself is designed so that there is a stable strong constraint | Implemented Architecture (Services/APIs) |

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Overview about the different value streams and business situations and their "constraint" should be

In various organizations, there are specific constraints that need to be considered in order to achieve their goals. Let's explore some typical organizations and their corresponding constraints.

One example is the production of finished falling parts such as screws or batteries. In this case, the constraint lies in the longest cycle time at a specific workstation or the one with the least capacity and highest investment to external resources. For instance, a heat treatment process in an oven, using a press, or an extruder may pose such constraints.

Another type of organization focuses on making products with high quality sensory properties, like olive oil or colors. Here, the constraint is the ability to differentiate between the qualities of the

products. Experts such as olive oil experts, sommeliers, or color experts play a crucial role in ensuring the desired sensory properties.

In the realm of manufacturing items according to customer's specific orders, also known as Make-to-Order, constraints arise at the point where multiple production lines come together. This can be observed in industries like mobile phone or car manufacturing, where the final assembly or the "marriage" of different components becomes a critical constraint.

Complex items with changing paths and varying orders, such as specialized chemical production, analysis, and pharmacies, present their own set of constraints. In this case, the expertise to operate specific machines becomes a crucial constraint. Without skilled operators who understand the intricacies of the machines, the production process may face challenges.

For organizations involved in specialized machinery or plant engineering, known as Engineering-to-Order, the constraint lies in having experienced engineers with long-term process expertise. These engineers play a vital role in ensuring the successful implementation of complex engineering projects.

In the context of product development for component producers or IT product companies, the integration phase becomes a significant constraint. This is the phase when the product is made ready for mass production, and it requires careful coordination and synchronization of various components and processes.

Service-oriented companies, such as consulting firms or agencies, face constraints during the critical phase of go-live at the customer organization or the start-up phase with the end customer. This phase is crucial for ensuring a smooth transition and successful implementation of the services provided.

Mature agile IT companies engaged in Agile Multi Project with running Continuous Integration/Delivery face a constraint in the creative idea generation phase. This is the initial stage where the team explores how to use the existing system optimally, and it requires innovative thinking from business analysts, engineers, and enterprise architects.

Lastly, organizations focused on streamlining value, like App-Environments, encounter a constraint in the creative part of designing the system and platform to have a stable, strong constraint. This involves implementing architecture, services, and APIs that optimize the value stream.

In conclusion, different organizations face unique constraints depending on their specific goals and scope. Understanding and effectively managing these constraints is crucial for achieving success in various industries and sectors.

B3 Strategic Priority: Business Value Optimization

In project organizations that are managed based on a virtual constraint or virtual drum, the strategic priority is determined by the octane number. The octane number is typically calculated by dividing the business value by the constraint consumption.

To maximize the utilization of the constraint and achieve the highest throughput, projects should be ordered based on their octane number. By prioritizing projects with higher octane numbers, the organization can make the most efficient use of the constraint in the shortest amount of time.

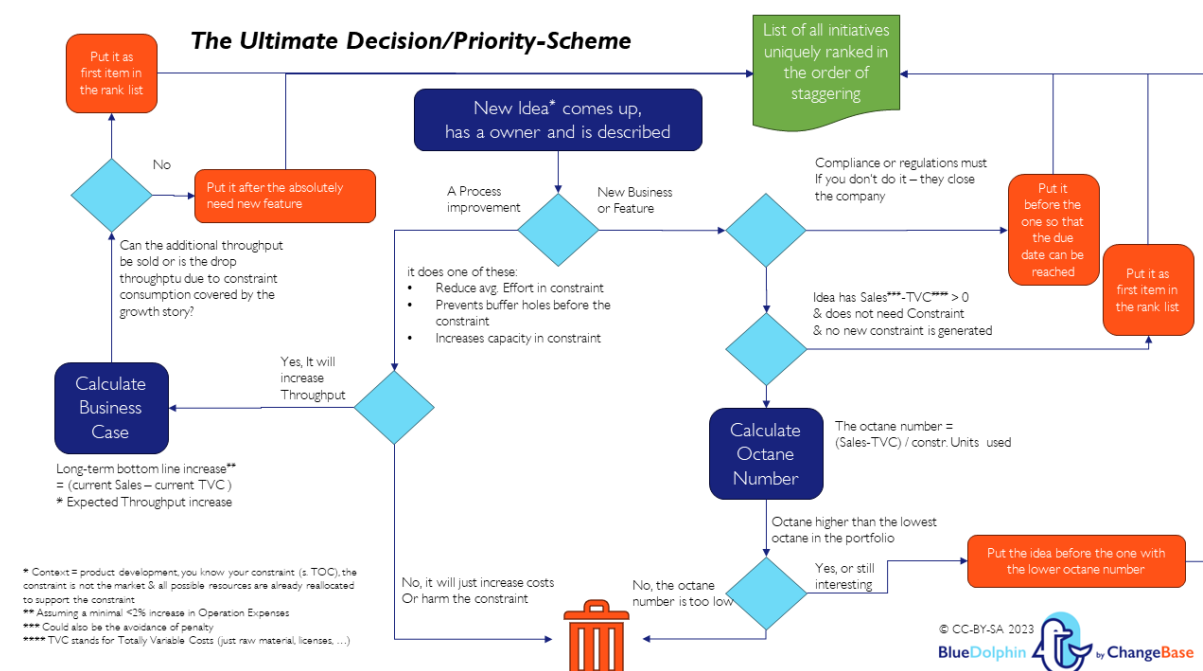
However, not all projects require constraint time. Some projects can be done at any time without causing any unwanted bottlenecks. These projects can be scheduled flexibly, as long as they do not generate any constraints or negatively impact the overall flow of work.

Projects that have the potential to reduce the average constraint consumption in the future are particularly interesting. These projects not only provide immediate value but also increase the octane number of all projects in the future. Therefore, they should be given the highest priority, as long as the cash flow is sufficient to cover the operational expenses.

Determining the business value of a project is crucial in calculating the octane number. The business value can be determined by considering factors such as sales and subtracting the total variable costs expected within a given time frame. This helps prioritize projects based on their potential contribution to the organization's overall value.

Constraint consumption is often measured in terms of days in the constraint or effort required in the constraint. This metric helps assess the impact of a project on the constraint and enables better decision-making when it comes to prioritizing projects.

In summary, strategic priority in project organizations is all about optimizing business value. By using the octane number as a guiding metric, projects can be prioritized based on their potential contribution to the organization's overall value and their impact on the constraint. This approach ensures that projects are scheduled in a way that maximizes throughput and minimizes bottlenecks, ultimately leading to improved efficiency and profitability.



Flow diagram: How to find the optimal strategic priority

In the world of critical chain multi project management, working with a virtual constraint is a crucial aspect. The first step in this process is to define a project phase or integration as the virtual constraint drum. This phase is typically the most critical and complex, requiring the expertise of the best individuals in the organization. By identifying this phase as the virtual constraint, we can effectively manage the workload and ensure that resources are not overloaded.

To determine the resource needs for the projects connected to the virtual constraint phase, we assign a value that represents the complexity of each work package. A value of 1 indicates normal complexity, while values less than 1 or greater than 1 represent less or more complexity, respectively. This allows us to accurately assess the resource requirements for each project.

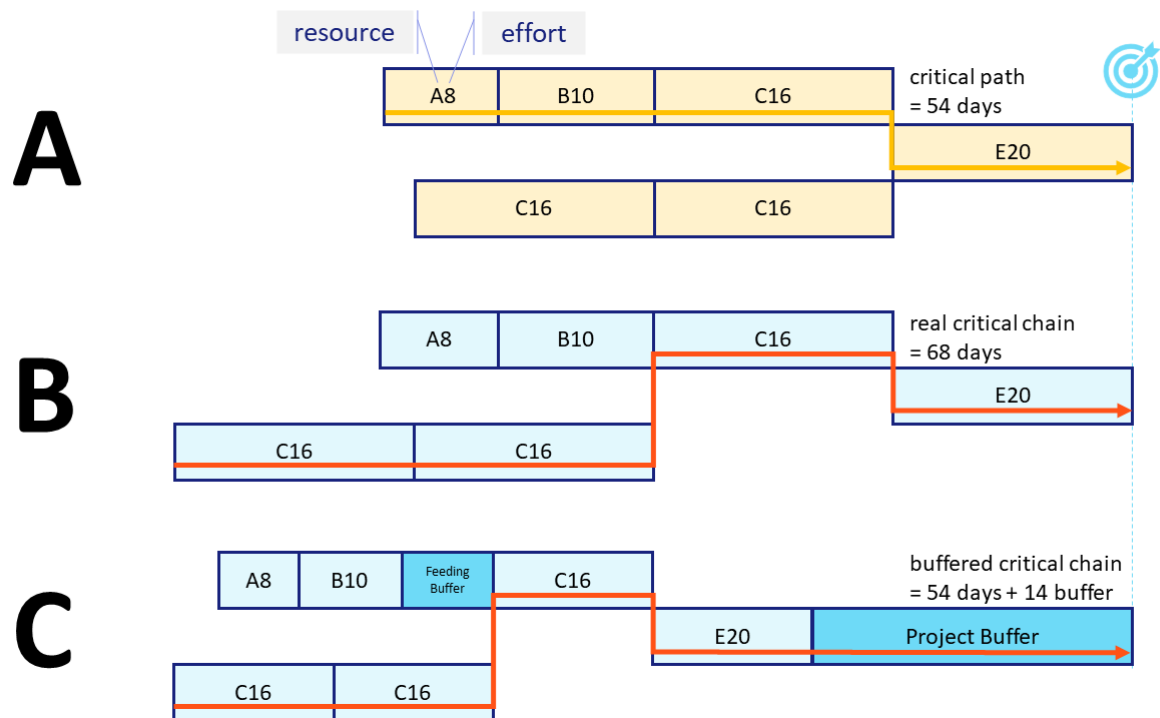
The capacity of the virtual constraint is then adjusted to ensure that no real resource is overloaded in the middle and long run. This means that we carefully manage the workload to avoid any permanent overload on the resources. By doing so, we can maintain a balanced and efficient project environment.

Practically, we use a template to create a rough planning for the projects. We then assess the complexity of the critical work packages within the defined virtual drum phase. Based on this assessment, we prioritize the projects and determine their due dates. The goal is to ensure that the virtual constraint is not overloaded, while still meeting the project deadlines.

If a new project needs to be added to the portfolio and requires an earlier due date, we can easily identify which other projects need to be moved to accommodate this change. However, it is important to note that any changes in project ranking or due dates require the acknowledgement of all stakeholders involved. This ensures that the strategic priority is maintained and that all parties are aligned with the changes.

Overall, working with a virtual constraint in critical chain multi project management allows us to effectively manage resources, prioritize projects, and make strategic decisions. By carefully balancing the workload and considering the complexity of each project, we can optimize productivity and achieve successful project outcomes.

B4 Excursus: Critical Path and Critical Chain



Differentiation between critical path and critical chain: (a) critical path without checking resource contention; (b) critical chain with resource contention eliminated = realistic plan; and (c) a critical chain plan with correct project buffers

The concept of the critical path has been a fundamental aspect of project management since its inception. It refers to the longest path in time from the start to the finish of a project, representing the minimum time required for its completion. This traditional approach to project planning focuses solely on task dependencies, disregarding the availability of resources.

However, as project management evolved and organizations began to handle multiple projects simultaneously, it became evident that resource constraints played a crucial role in project success. This realization led to the development of the critical chain concept by Eliyahu M. Goldratt.

Goldratt's definition of the critical chain goes beyond task dependencies and takes into account both task and resource dependencies. It recognizes that in a multi-project environment, resources are often shared and compete for allocation. The critical chain, therefore, represents the longest chain of tasks that considers both task and resource dependencies.

By incorporating resource constraints into project planning, the critical chain approach provides a more accurate estimation of project durations. Instead of assuming unlimited resources, it calculates durations based on the real availability of resources, considering the project as if it were the only one in the organization. This ensures that the plan is feasible and achievable within the given resource constraints.

One of the key advantages of the critical chain approach is its ability to prevent resource overloading. By staggering the allocation of resources and taking into account their availability, the critical chain plan ensures that resources are not overwhelmed with excessive workloads. This allows the project to be executed as planned, resembling a single project with all resources readily available.

In summary, the critical chain concept represents a significant improvement over the traditional critical path approach. It acknowledges the importance of resource constraints in project management and provides a more realistic and accurate estimation of project durations. By

considering both task and resource dependencies, the critical chain approach enables organizations to effectively manage multiple projects and optimize resource allocation.

B5 From Buffers and Their Sizing

In the world of critical chain multi project management, buffers play a crucial role in ensuring project success. There are two types of buffers that are commonly known - the project buffer and the feeding buffer.

The project buffer is placed at the end of the project to protect the due date. It acts as a safety net, allowing for any unforeseen delays or disruptions that may occur during the course of the project. By having this buffer in place, project managers can have peace of mind knowing that they have a contingency plan to rely on if needed.

On the other hand, feeding buffers are used to protect the feeding chains before they integrate into the critical chain. These buffers are strategically placed to decouple the critical chain from any potential delays in the feeding chains. By starting the feeding chains a little early and inserting a block of time as a buffer, the critical chain remains protected and unaffected by any lateness in the feeding chains.

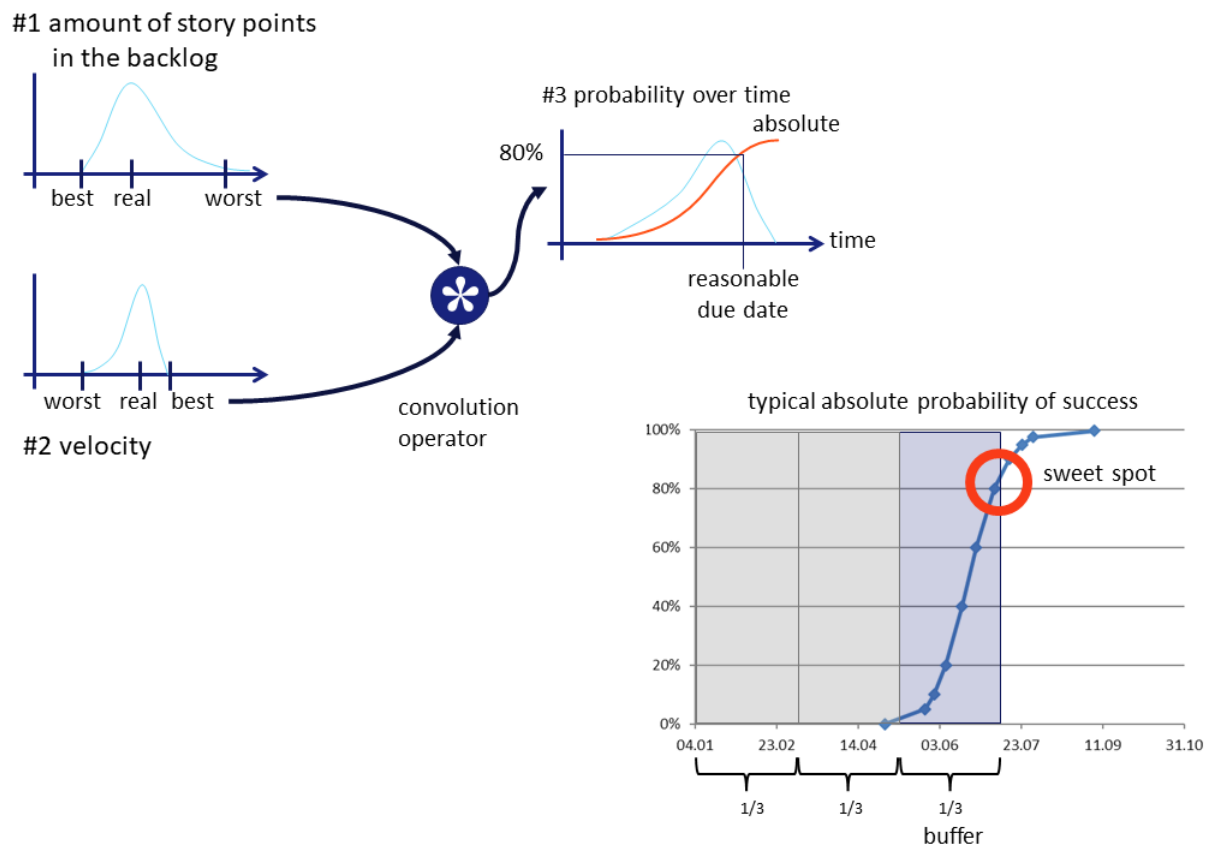
Now, the question arises - how do we determine the size of these buffers? Calculating the size of the buffers is of critical importance as it directly impacts the project's success. There are various methods and techniques available for buffer sizing, each with its own advantages and considerations. Some common methods include reviewing historical data, considering uncertainties, and even dynamically changing the buffer size as the project progresses.

As a critical chain multi project management expert, it is essential to have a deep understanding of these buffer management techniques. By utilizing advanced dynamic buffer sizing techniques, we can optimize the buffer size based on the unique characteristics of each project. This ensures that the buffer is neither too large nor too small, providing an accurate representation of the project's progress and potential risks.

Ultimately, the goal of buffer management is to protect the critical chain and ensure that it receives the highest level of priority. By monitoring the buffer consumption and comparing it to the progress on the critical chain, project managers can gain valuable insights into the project's health and identify any potential trouble ahead. The buffer serves as a leading indicator, alerting us to any unfavorable variability and allowing us to take proactive measures to mitigate risks and keep the project on track.

In conclusion, buffers are an integral part of critical chain multi project management. They provide a safety net and protect the project from disruptions and delays. By understanding the different types of buffers and how to calculate their size, project managers can effectively manage projects and ensure their successful completion. Buffer management techniques allow for better control and monitoring of the project's progress, providing valuable insights and indicators of potential risks. With the right buffer management in place, projects can stay on track and achieve their desired outcomes.

B5.1 The Math Behind Buffer Sizing



Probability curves of estimations and the convolution operator to calculate the resulting absolute probability

In the world of project management, estimations play a crucial role in determining the success and feasibility of a project. However, estimations are not fixed values but rather probabilities that can vary based on different factors. To understand these probabilities, we can visualize them as curves, starting from an optimistic value, reaching a peak at the most probable value, and tapering off into a long tail of pessimistic estimations.

To determine the optimal buffer size for a project, we can utilize the concept of the convolution operation from probability mathematics. This operation involves folding two probability curves together to calculate the resulting probability. In the context of project management, this means applying the convolution operation to all the work packages on the critical chain, one by one.

Fortunately, the convolution operation is a gentle process, gradually bringing the resulting curves closer to the 50% value and tightening the curve with each iteration. After performing the convolution operation on 3-5 work packages, the probability curve begins to resemble a bell curve, with the most probable value being the sum of half the surface area under the probability curve.

As a practical approach, one can start by cutting all realistic values by 50% and adding 50% of this value as a buffer. While this assumption may not perfectly align with the true probability distribution, it provides a good starting point for estimating the buffer size.

Alternatively, estimations can be made by considering both optimistic and pessimistic values and assuming a bell curve distribution between these two points. Although this approach may not capture the exact shape of the probability curve, it is often deemed sufficient for practical purposes.

It is important to note that as a critical chain multi-project management expert, understanding and utilizing these probability concepts is essential. By incorporating the convolution operation and considering the probabilities associated with estimations, project managers can make more informed decisions and create realistic project plans.

In conclusion, estimations in project management are not fixed values but rather probabilities that can be visualized as curves. By applying the convolution operation and considering the probabilities associated with work packages, project managers can determine the optimal buffer size and create more realistic project plans. While these estimations may not perfectly align with the true probability distribution, they provide a practical approach for managing projects effectively.

B5.2 Buffer Sizing

| Type of Projects | Duration reduced down to ... | Buffer = x% of the critical chain |
|-------------------|------------------------------|-----------------------------------|
| Internal projects | 50% | 50% |
| External Projects | 50-66% | 50% |
| Single Projects | 66% | 50% |

Typical project situations and their sizing of buffer

In the world of critical chain multi-project management, the size of the buffer plays a crucial role in ensuring project success. When it comes to internal projects, there is typically less pressure to deliver on strict deadlines, allowing for more flexibility in buffer sizing. In these cases, it is common for the real buffers to be higher than necessary. To address this, we recommend reducing the duration of work packages to 50% of their realistic duration and adding 50% of this duration to the buffer. This ensures that the buffer is sized appropriately and allows for a more efficient project timeline.

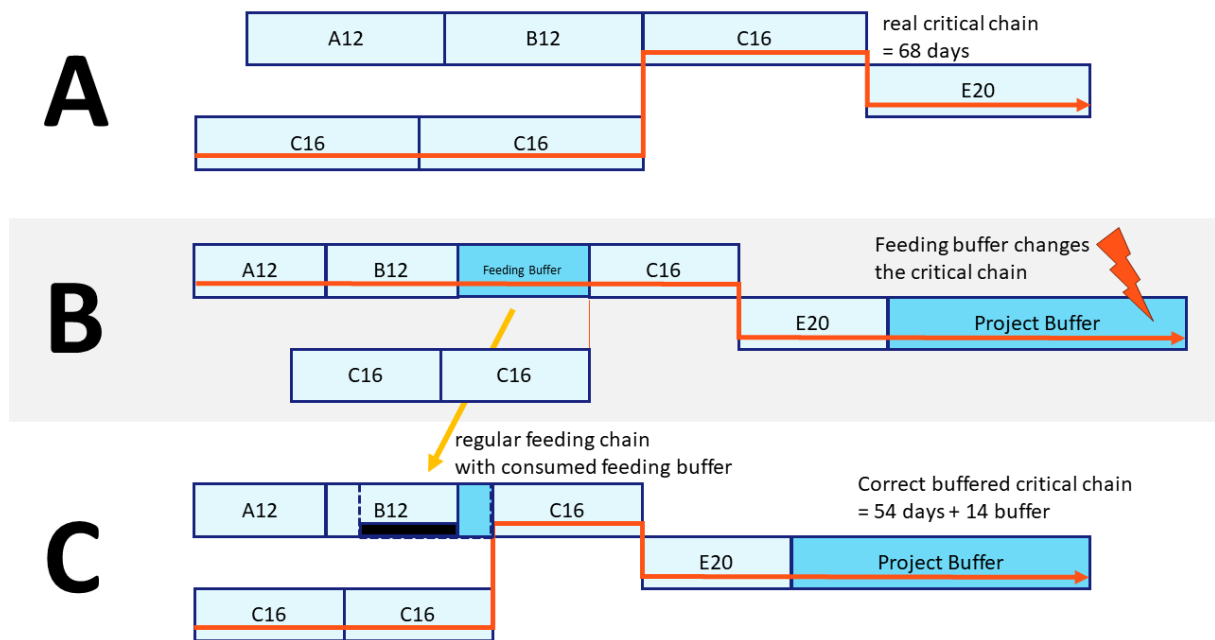
On the other hand, when dealing with external projects, the market and customer expectations already play a role in determining the acceptable buffer size. If the buffer is too large, it may lead customers to seek out competitors who can deliver faster. To avoid this, we recommend slightly reducing the duration of work packages or adding a slightly larger buffer. This strikes a balance between meeting customer expectations and maintaining a realistic project timeline.

For single projects, where all necessary resources are available, the focus is on delivering the project as quickly as possible. In these cases, it is important to carefully assess the required buffer size. Often, we recommend reducing the duration of work packages to 66% of their original duration and adding a buffer of 50%. This ensures that the original project duration is maintained while still allowing for some flexibility in case of unexpected delays.

Regardless of the type of project, it is crucial to choose a reduction and buffer size that allows for a 25% or minimum 10% lead time reduction. This reduction is necessary to fuel the continuous improvement process and accelerate the learning curve. The larger the reduction, the faster the learning curve will be, leading to more efficient project delivery.

By carefully considering the specific needs and constraints of each project, and implementing the appropriate buffer sizing strategies, critical chain multi-project management can be optimized for success.

B5.3 Feeding Buffers When Chains Are Equally Long



How to deal with feeding buffers when feeding chains are equally long? (A) shows a chain A12, B12 feeding into the C16, E20. (B) shows what happens if you add a 50% buffer as a feeding buffer - the critical chain elongates. (C) shows the right approach - the feeding buffer is preconsumed and the critical chain is untouched

In the realm of critical chain multi-project management, one of the key strategies employed is the use of feeding buffers. These buffers serve to protect the critical chain from potential delays caused by the feeding chains. To achieve this, the feeding chains are started a little early, and a block of time, known as the feeding buffer, is inserted to decouple the critical chain from each feeding chain.

The concept of feeding buffers is crucial in synchronizing the various paths to the critical chain. By subordinating everything else to the constraint, we ensure that the non-critical chains do not impede the progress of the critical chain. Feeding buffers act as a safeguard against unforeseen difficulties and disruptions that may arise in the non-critical chain tasks feeding into the critical chain. Additionally, they allow critical chain tasks to start early if circumstances permit.

Feeding buffers are strategically placed at integration points where the feeding chains meet the critical chain. This integration risk is reduced by securing the feeding chains, and daily status updates are provided in the form of easily understandable fever curves for all buffers. This enables the management team to have a clear overview of buffer consumption and progress, allowing them to take concrete measures to regain buffer if necessary.

The project buffer, which is another type of buffer in critical chain project management, is also established. However, it is important to note that the feeding buffer is separate from the project

buffer. The project buffer is specifically designed to protect the critical chain itself and requires the highest level of priority from project managers.

To further clarify the concept of feeding buffers, let's consider a project with one critical chain and several non-critical chains. The safety built at the task level is pooled together at the end of both the critical chain and non-critical chains. This aggregation principle allows for the averaging out of variations and risks, similar to how insurance aggregates multiple risks.

By reducing the total duration of the path, the feeding buffers contribute to a more efficient project timeline. They ensure that the critical chain remains the constraint and enable project managers to exploit its potential fully. Monitoring progress on the critical chain relative to buffer consumption becomes the primary focus of project management and controlling.

It is essential to actively manage deviations by strategically placing buffers at appropriate locations, such as before the integration point, at the end of feeding chains, and at the project's end. These buffers do not extend the project's duration but rather reallocate time from work package estimates. Critical Chain Project Management has proven to be a powerful approach for dealing with project management deviations in an agile manner.

While critical chain management is often associated with single projects, its true strength lies in portfolio or multi-project management. From a portfolio perspective, project management resembles production, with the goal of delivering as many projects as possible on time and with good quality.

In conclusion, feeding buffers play a crucial role in critical chain multi-project management. They protect the critical chain from potential delays caused by the feeding chains and allow for efficient synchronization of project paths. By actively managing deviations and strategically placing buffers, project managers can ensure the smooth progress of the critical chain and optimize project timelines.