

Abstract Number: 025-1270

ANALYSIS OF *PMBOK* (2008) FROM THE PERSPECTIVE OF CRITICAL CHAIN

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23rd Annual POMS Conference

April 20 – April 23, 2012

Chicago, Illinois, USA

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ABSTRACT

The PMBOK is a set of best practice in project management. Since that critical chain examines the projects in a perspective of global outcome (time, budget and scope), this paper aims to relate the practices of the PMBOK with critical chain, seeking a common denominator, which is the project's success.

1. INTRODUCTION

After the World War II ending there was an increasing necessity of productivity improvement, because due to the conflict years there was a suppressed demand that needed to be adressed. For those countries that got out of this event devastated, like Japan, an as cheap as possible productivity increase was a necessity, but not sufficient. Looking for a global performance system was a must. According to Csillag (1991) productivity refers to the impact caused by a local decision. Goldratt & Cox (1992) believe the productivity corresponds to making a company getting closer to its goal. Facing this need for productivity increase, Japan developed a productive system that was conceived in Toyota's factory at the beginning of the fifties which eliminated drastically the production system's wastefulness leading to cost reductions. This system was disseminated during the seventies and it showed that it was possible to improve performance through more advanced techniques in which continuous improvement represented the system's heart. This system is known as Just in Time and it works as an endless optimization process of the current situation. Other techniques were introduced since then in order to control, measure and improve the organizational performance, as well as its processes. Some examples are: Zero-Base Budgeting, Activity

Based Costing, Balanced Scorecard, Quality Management and Theory of Constraints. This evolution was important because in the last three decades the market has become more competitive and the shareholders have become avid for more expressive results in order to satisfy their needs. The companies needed to look for more operational efficiency and effectiveness so that they could justify their investments.

The maximization of shareholder resources is fundamental for the company to keep growing and reinvesting its profits in investment projects that generate return beyond its cost of capital or, in other words, a positive Net Present Value (NPV). Besides being pressured to accomplish short term efficiency and effectiveness as well as long term innovation and strategies, the managers should also ensure that this composition provided competitive advantage to the company. As an example for efficiency and effectiveness we have operational costs reduction, management practice improvement, production mix redefinition with an improved margin, pricing strategy, improved working capital management, etc. As to long term business strategies and innovation it's possible to quote: higher added value products and services development, positioning products and services in new markets, market share increase, etc.

What has been realized is that these factors have led managers to implement practices that are many times considered normative, like Lean Production, MRP Systems, Six Sigma, ISO 9000, Project Management Body of Knowledge (PMBOK), among others. The dynamical environment that companies are facing has taken them to look for efficiency levels above average through these practices use. Scholars have been studying deeply the efficiency matter inside the business environment (Cua, Mckone & Schroeder, 2001; Imai, 1986; Kaynak, 2003) as well as how successful these practices implementation have been (Bessant, Caffyn & Gallagher, 2001; Jorgensen, Boer & Laugen, 2006; Powell, 1995). Researches have shown that the use of the normative practices has brought benefits to the organizations (Chow

& Lui, 2011; Christensen, Germain & Birou, 2005; Inman, Sale & Green, 2009). But when we look at the project management matter we realize that many problems occur, affecting its efficiency, as for example: deadline definition unsuitable to the project's magnitude, delivery date delays, failure in accomplishing the initial budget, client's requirements documentation incomplete, mistakes during initial scope definition, etc. Even when project management acknowledged techniques are used, like PMBOK for instance, these problems occur. And this has concerned scholars, professionals and governments.

What has been realized is that project managing is not an easy task! As a matter of fact, it's known that project managing is a hard task, always challenged by failures in accomplishing deadlines, costs, resources disputes, and quality, among others. An American institute has been observing project managing for many years and noticed that 24,0% of all projects observed were cancelled before completed, 63,0% failed to be completed on time and 45,0% failed to be completed within the initial budget (The Standish Group Chaos Report, 2009). The question is why these problems keep occurring even though there are many good managing practices available in the business environment. As much as this question concerns project managers, it concerns scholars who try to understand why these problems still happen.

One alternative to the PMBOK that has come to scholars' and professionals' attention is a methodology proposed by Eliyahu Goldratt named Critical Chain which tries to manage the problems listed above. Researches have shown that 95% of the projects that used this methodology in the correct way were able to accomplish deadlines and to work within the initial budget (Mabin & Balderstone, 1998, 2003).

Leach (1999), an expert on PMBOK, points to a substantial advance regarding continuous improvement when the project management is based on Critical Chain methodology instead of PMBOK. And that, according to him, comes from the application of Theory of Constraints and Statistics Theory to the project system.

Considering that project management methodologies, like PMBOK and Critical Chain, have proposals that intend to fulfill the initial projects' scope, deadlines, costs, shareholders' necessities, among others, this article's objective is to relate PMBOK and Critical Chain practices, looking for a common denominator, that is the project's success. We also intend to understand which are the main differences between these methodologies and their benefits.

The article starts with this introduction followed by (i), the second part describe a literature review about PMBOK and Critical Chain practices; (ii) in the third part the article tries to identify the main difference between both methodologies and which are their main advantages; (iii) in the fourth part the results are presented; and (iv) in the last part the article is concluded.

2. LITERATURE REVIEW

Knowing that projects assume an important role in the company and that they must be aligned with strategic objectives, the Resource-Based View theory (RBV) should be able to support them. When developing this theory, Barney (1991 and 2001), Peteraf & Barney (2003) and Wernerfelt (1984) state that when a company follows only one strategy which is hard to be imitated and substituted and that is based on its internal resources, it acquires a competitive advantage. By other hand, there are costs due to the managing process transactions, it's expected that there will be cost due to the project managing transactions that could in a certain way impact in predefined budgets. For example, urgent calls costs that weren't defined in the initial scope. Therefore, the Transaction Cost Theory (TCT) could also explain some of the problems faced during project management because of the big number of contracts related to it that should be negotiated and managed depending on how extensive the project is.

Considering strategic aspects, Bouer & Carvalho (2005) and Marques Junior & Plonski (2011) highlight how important projects are and argue that they are the path through which companies launch new products, implement strategies, launch new business, and improve current products. Due to this strategic importance an efficient and effective project management becomes a *sine qua non* condition, but that's not what we see in real life. A bibliometric analysis was performed by Marques Jr. and Plonski (2011) and they realized that only 28% of the implemented information technology projects were successful and 85% of the projects weren't able to accomplish deadlines and initial budgets. Facing these negative numbers, Stratton (2009) argues that even though we have seen management knowledge advances, there is still a lot to do regarding project management theory.

2.1. PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK)

METHODOLOGY.

As years went by many alternatives to improve project management were presented. The Project Management Body of Knowledge (PMBOK) was one alternative developed by scholars and management professionals in order to satisfy this management need. PMBOK is the most popular project managing guide around the world and it identifies nine knowledge areas in which the project manager should focus during a project lifetime (PMI, 2009). Actually this guide consists of a group of good project managing practices and it's widely accepted, but according to Bouer & Carvalho (2005) it shouldn't be applied evenly in every kind of business.

Among the knowledge areas offered by this guide, project planning is pointed as one of the main requirement to success. But this phase is widely criticized in the literature due to the managers' ability to forecast accurately the activities costs and duration (Zwikael, 2009). When checking if the project managers focused on any of the nine knowledge areas during the

project planning, as well as its impact over the success of the project, Zwikael (2009) found out that each of the nine knowledge areas has a different influence over the success of the project, and among them the ones that were considered more relevant were Time, Risk, Scope and Human Resources Management. The ones that were considered less relevant were Costs Management and Acquisition Management.

There are factors that are known to be fundamental to the organization for their strategic role, Human Resources Management for instance, but when talking about project management it doesn't seem to work this way. PMBOK recognizes its importance, but Belout & Gauvreau (2004) show that even though there is a link between human resources and the success of the project, this doesn't impact significantly over this success. Lim & Mohamed (1999) indicate that the success of the project depend on the micro and macro point of view perspective. The macro point of view is related to the concept of the project and the micro point of view is related to its construction phase. Kerzner (1987) identified six project management success critical factors: corporate understanding of project management, executive commitment to project management, organizational adaptability, project manager selection criteria, project manager's leadership style, and commitment to planning and control. Gillard (2009) points out that excellent interpersonal, or soft skills, are necessary requisites for success in project management and that the leadership style of the project manager directly impacts the outcome of the project. According to this author, it is becoming more evident that success in the role of project manager cannot be attained with a technical skill set only. Technical skills are being recognized as one of the minimal requirements for a project manager (Gillard, 2009). Analyzing in IT project, Bakker et al. (2010) point out that both technical risk factors and organizational risk factors, such as senior management support and user participation, are highly influential.

The traditional approach to project management puts a lot of emphasis on assuring conformance to time, budget and scope constraints (Perminova et al., 2008). However, according to these authors, considerations, such as continuous improvement, customer-centric thinking, reflective learning are often left behind. When analyzing the risk management in project, uncertainty can be regarded as one of the characteristics of evolution and according to these authors: if you do not have uncertainty, you do not have any evolution. Therefore, managing uncertainty is one of the core elements in firm's better performance (Perminova et al., 2008).

Another point that impacts project management is flexibility. At the same time that the organization's need to adapt to changes and uncertainty in the business environment, project managers are challenged to keep their projects (Olsson, 2006). This study, when analyses flexibility in large investments projects, reveals a paradoxical approach to project flexibility: flexibility is frequently used but rarely prepared for. However, one consistent critical success factor for every endeavor is the ability to adapt to an ever-changing market (Indelicato, 2009). Kendall et al. (2001) points out that Critical Path (CPM) uses a concept of slack time or float to determine how much flexibility there is in non-critical path tasks. And another important finding that this author mentions is that CPM changes during execution because there is no buffer to absorb the variation in task times.

2.2. THE CRITICAL CHAIN METHODOLOGY

One alternative to the use of the PMBOK is the methodology developed by Eliyahu Goldratt named Critical Chain (CCPM). The Critical Chain consists of a management methodology based on the Theory of Constraint (TOC) philosophy. Goldratt & Cox (1992) defined a system restriction as being anything that stops the system from accomplishing its target performance.

According to Rand (2000), the necessity of a new approach in project management was motivated by the fact that Critical Path Method (CPM) frequently fails even after expensive software support.

TOC is a philosophy adopted by Goldratt at the end of the Eighties, that was initially focused in manufacturing companies targeting physical restrictions (bottlenecks) identification and management ones, like manufacturing processes equipment bottlenecks for example. Restrictions that show up outside the manufacturing environment are called “not physic” restrictions and can be related to the company`s internal environment. Some examples of not physical restrictions are: policies, procedures, resistance to change among others. These restrictions can also occur due to the market, as for example: low demand, limitation rules or quickly changing environment. TOC`s working principle provides a continuous improvement focus (Rahman, 1998). But the continuous improvement process must be focused on throughput (Csillag, 1991).

When analyzing the manufacturing environment, Goldratt realized that even though implementations have been successful, they weren`t sustainable. Facing that in 1994 he developed a tool based on logical and intuitive processes named Thinking Process (TOC-TP). This tool aids improvements identification, correction and implementation taking into account management, behavioral or policy related restrictions. This improved TOC recognized that main restrictions in most of the organizations can be related to management policy related restrictions (Rahman, 1998). And in 1997, worried about problems that were generated by project management, basing on the Thinking Process and TOC concepts applied to serial production, he developed a new lean managing philosophy named Critical Chain (CCPM).

The “critical path” established by PMBOK is the sequence of planned activities during the project that sums the smallest time leeway. Consequently the project manager must pay attention to this sequence. Differently from Critical Path, Goldratt considers Critical Chain the same as Critical Path but considering also the available resources to execute the tasks. This method is based on:

- a) Reducing aggressively the tasks' duration, since safe forecasts often hide extra time;
- b) The project buffer which is holistically determined and isn't focused on individual tasks;
- c) All project members have a global view of the events that are causing delays and this events are highlighted;
- d) Each task must start on the right time, not before that;
- e) Motivating team members to execute tasks once they are made responsible for them.
- f) Eliminating resources conflict through Thinking Process (TOC-TP) method;
- g) Often controlling the project's buffers;
- h) Taking into account the statistics fluctuation fundamentals.

The fundamentals defined by Goldratt to the CCPM methodology is essentially normative and pragmatic. However the success of this method can be caused by a behavioral change, what would justify CCPM adoption. Existing studies have shown that there is a growing necessity for behavioral change in order to accept new values and paradigms (Bendoly & Hur, 2007; Herroelen & Leus, 2001). Facing that Bendoly & Hur (2007) argue that part of the project's success can be attributed to beliefs compatibility. For example, "always executing a task as fast as possible", "not delaying task that could be already done", "the global result matters, not the local one", "don't allow your mind to be a system restriction", "continuous improvement and search for the next restriction", "the chain weakness is located in its weakest link", among others. In a certain way behaviors are responsible for a condition of pursuit of excellency.

According to Raz et al. (2003), the proponents of CCPM claim that it is a totally new, revolutionary way of thinking that can lead to superior, even unprecedented, performance in terms of reducing delivery time and increasing the ability to meet schedule and budget commitments.

Goldratt (1998) developed the CCPM, TOC-based, as main objective to manage projects without delays due to uncertainties, budget overruns and out of scope. The alternative found to cope with uncertainty was the project buffer to the end of the project critical chain.

This current can be defined as the longest chain of dependent tasks in which there are resource constraints (Lechler et al. 2005; Dachyar & Saputra, 2009). These resources, also called critical resources are those that are required to complete tasks through the critical chain (Raz et al., 2003). Lechler et al. (2005) suggest that the management of resources in multiproject environments represents a fundamental challenge to project managers when dealing with this complexity where competition for scarce resources can also be a major policy concern. The next step would be to estimate the duration of tasks to a minimum. In practice, due to uncertainty, project teams tend to overestimate the time to complete tasks (this corresponds to slack safety margin of the project). The CCPM suggests that this buffer is to consider the end of the project, that is, the buffer of each task is not made available to the executors of tasks such as getting a reserve of time that will be used if needed. There is also a feeding buffer which acts as a protection of critical chain against uncertainties in the noncritical chain, and its size is adjusted if necessary (Raz et al., 2003).

Usually the project managers tend to put a certain safety margin due to the level of uncertainty in the environment. One of the critical assumptions is that the supply chain projects should include sufficient security, but what is observed in practice is that it puts more security than necessary (Goldratt & Kishida, 2009). And it runs due to the performance and maturity of the teams in the organization, which according to Goldratt & Kishida (2009), needs to be corrected in order to increase performance in any environment projects.

There are several types of projects that are deployed in the organization, for example, product development project, costs reduction project, design of profit increasing, reducing cycle time project, improve quality project, Supply Chain Management project, Lean Production project, Six Sigma project, etc. All these have a direct relationship with the management (Goldratt & Kishida, 2009). Managing a project means to meet the requirements

defined in terms of time, budget and scope. And their success contributes to the organization to achieve its goal set by the shareholders.

The safety margins that are placed on each project task individually due to the level of uncertainty to act as a protection, however, are wasteful of time and resources. These margins are part of a bad project planning and results in unnecessary expenditures of time, both financial resources (expenditures to support the project) and non-financial (e.g. manpower, material resources, infrastructure, etc.) when they are wasted. Kendall et al. (2001) point out that finishing certain projects earlier add value to the organization well out of proportion to their cost. For some members of the project team, the safety margin is also some flexibility due to the uncertainties and their reduction, although beneficial as it increases efficiency, can generate uncertainty in risk taking. Goldratt & Kishida (2009) also suggest that the reduction in safety margin does not allow a project team member to move to another project to work on a possible need. This little flexibility can contribute to project failure because it can cause delays in deliveries, affecting the budget and still does not contribute to the sharing of information (knowledge and know-how) between the project teams.

There are three ways to waste the protection that is placed on projects. The first is called the student syndrome, in which the project team begins to work as late as possible and / or Parkinson's Law. According to this law if the project team will have five days to complete a task, then, the five days will be spent in this task. That is a tendency of human beings to use all the time that was given to the implementation of the activity; the second phenomenon is the multi-tasking - more projects means more people will jump from one task to another and consequently increase the lead time of the same; and finally, the third involves the interdependence between stages. These dependencies make the accumulated delays at the same time as the advances are wasted (Goldratt, 1998).

The failures occur as the three main pillars of a project that is the time, budget and scope are not met. This occurs largely because of the inefficiencies - highest level of protection that is placed on each stage of the project or the project as a whole that ensures a natural relaxation of those involved. Goldratt (1998) states that even when we put too much protection in each phase of a project, but still the project as a whole is exposed to uncertainty. The management of the buffer corresponds to the fundamental requirement to the success of the project, however, a criticism that is made is that the Critical Chain methodology does not establish clearly how to determine the buffer size (Raz et al., 2003). One way around this would be to consider the Goldratt's suggestion that to adequately protect a project variances, the project buffer should have duration of approximately 50% of the length of the critical chain. In practice, the buffer size which is usually defined by project managers depends heavily on the environment - how much is risky? And how variable is the duration of the task? What has been observed in practice is that a range between 30-50% is common (Kendall et al., 2001).

There are three types of buffer: project buffer that represents the time that is allocated to the end of the critical path, the resource buffers used to send a signal to a resource that is considered critical that a new phase will be initiated shortly in the critical path; and feeding buffers that is the time allocated to the end of a non-critical path that joins the critical path. This will act as a buffer protecting the critical path (Goldratt, 1998, Raz et al., 2003).

Goldratt (1998) and Lechler et al. (2005) present procedures for designing a project based on CCPM in the footsteps of TOC. First, one must identify the critical chain project that represents the longest path of this sequence. Conflicts over resources are at present being solved. Second, explore the bottlenecks of the system by removing the safety margins allocated to individual activities and add them to the end of the critical chain project to create the buffer, which will act as a global protection. Individual activities are reduced to 50% of

the time previously estimated. One way to create stability in the project is to create the resource buffers and feeding buffers. The third step is to make the restriction, that is, the feeding buffer that represents the protection of a non-critical path is subject to the critical chain. The fourth step would be to elevate the constraint by adding capacity in the system.

Even with the benefits that this methodology presents, Kendall et al. (2001) show that the CCPM still suffers from mistrust on the part of the project managers. They said the reaction to the CCPM many experienced project managers have been somewhat negative. First, most people who have professionally managed projects for many years are skeptical to say that this improvement is possible. Second, there are arguments that some aspects of CCPM is conflicting with current best practices of the PMBOK. Finally, many experienced project managers have used some concepts of this methodology in their projects, and shown to label angry critical chain.

When planning a project, deadlines should be very close to the estimated execution times of tasks considering the dedicated resources, unlike the current practice of the organizations is the allocation of resources in times of performing multiple tasks simultaneously. It also provides a significant reduction of behaviors called student syndrome and Parkinson's Law (Kendall et al., 2001).

3. COMPARISON OF METHODOLOGIES: PMBOK VERSUS CRITICAL CHAIN

A question that arises when we choose which methodology to use in project management is what is the best? How to know if we choose the most appropriate methodology? Do the differences between methods are so significant? These methodologies are suitable for any kind of project? Dachyar & Saputra (2009) evaluated projects in the telecommunications industry in Indonesia based on the PMBOK methodologies and CCPM and found that in relation to the factor "time", the project duration by CCPM was lower than

the CPM - (197.75 CCPM's days against 207 days of the CPM). Regarding factors such as the "Scope" and "Output data", CCPM was also superior. However, the factor "Input data" by CPM was better due to the low complexity of the data entry and also does not require specific software for it (it uses the same company's software). In the factor "cost" was not found significant differences between the methods because the contracts were not based on duration. Lechler et al. (2005) analyzed the two methods showed that the main difference was the use of CCPM by TOC that focuses on the improvement of system performance, especially in resource management in environments with multiple projects. The CPM is deficient in this regard. Another issue noted by these authors is that the CCPM although its application is more complex, much of its ideas can be adapted for practical. With regard to resource management, unlike the CPM, CCPM distinguish between critical and non-critical resources and puts a lot of attention in the planning and management of critical resources. CPM is already features as a less important issue that must be subordinate to the critical path planning, without distinction between a resource bottleneck and non-bottleneck resources (Lechler et al., 2005). Kendall et al. (2001) state that the amount of resources of manpower planning in the critical chain is usually lower than in a traditional planning to do the same work. This occurs, according to these authors, due to the removal of the work consumed with multitasking and task time not dedicated.

Another important subject is about the quality control of the project. In PMBOK this process consists of monitoring specific project results to determine if complied with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance. Already CCPM focuses on identifying and removing the causes of performance problems (Kendall et al., 2001).

A big difference among the two systems is the control. In PMBOK, the control is according what percentage of the total project was performed. In CCPM the control of the buffers is according the missing time to finish the work.

4. MAIN FINDINGS

The integration of the Critical Chain thinking and practice and the Project Management Body of Knowledge (PMBOK) can be emphasized in the nine knowledge areas of the PMBOK (2008) and the main items of the Critical Chain (Kendall et al., 2001), as described in the following figure:

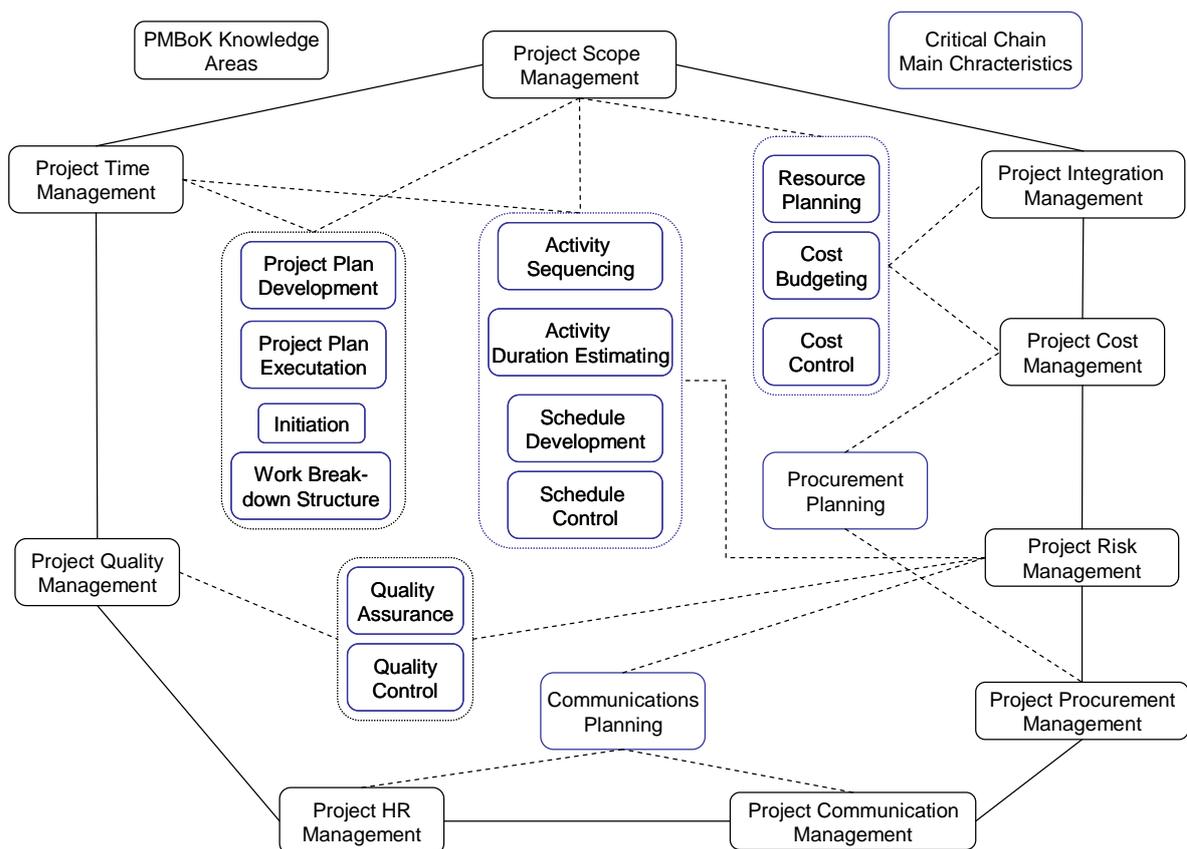


Figure 1: Main interactions between the PMBOK Knowledge areas and the Critical Chain thinking and practice (Adapted from PMBOK, 2008 and Kendall, 2001)

As part of the holistic approach to manage the project using the Critical Chain we could describe the following items:

Project Plan development

- Obstacle to be identified.
- Intermediate objectives to be established.
- Critical Chain Approach (schedule development, critical resource availability, etc.).
- Intermediate date constraints are discouraged (unless for a strategic reason).
- Schedule tasks start dates may be later than traditionally practiced (usage of buffers).

Project Plan Execution

- The Critical Chain plan is one of the inputs.
- Buffering report as essential output.

Initiation

- Expected benefit from the project - Expected Net Present Value (NPV).
- Identification of NPV positive changes in case of earlier delivery and the NPV negative changes in case of later delivery.

Work Break Down Structure (WBS)

- Input for the NPV analyses.

- The WBS analyses identify which tasks are reliant on a strategic resource (the Drum resource).
- Look the throughput and project costs in deciding the most appropriate approach for effective decision making resource planning.
- Critical Chain plan schedules summary level activities to explicit their dependencies.

Activity Sequencing

- The Critical Chain method includes any resource dependencies in activity sequencing.
- Activity Duration Estimating.
- Critical Chain activity durations are estimated assuming no bad multitasking and resource dedicated to tasks.

Schedule Development

- Developed using the Critical Chain method as the primary tool.
- Schedules include a Project, Feeding, Resource, Strategic Resources and Drum buffers.
- Tasks normally start as late as possible to eliminate "students' syndrome" and "Parkinson's Law".
- Early starts would represent investments that were done too early.
- Early starts also significantly increase the risk of multi-tasking.
- Safety is provided by the buffers.

- Resource leveling is simplified due to multi-project Critical Chain of staggering the introduction of a project according to the availability of the strategic resource.

Schedule Control

- Buffer management is the primary schedule control mechanism, for the overall project.
- Team members are not given due dates. Rather, they are asked to report the days remaining on each task.

Resource Planning

- Resource requirement quantities are considered in terms of the three global parameters of the TOC - throughput, investment and operating expense.
- The amount of labor resource in a Critical Chain plan is typically significantly smaller than for a traditional plan to accomplish the same work due to the labor consumed with bad multitasking and non-dedicated task time is removed.

Cost Budgeting

- The cost baseline should include some calculated worth of the project and Feeding buffers. These buffers allow for uncertainty in task estimates. This is equivalent to the traditional project cost reserves.

Cost Control

- The TOC suggests that a systems approach is vital, with respect to cost control and measuring performance to budget.

Quality Assurance

- By identifying common causes of project slippage, not only can their results be included in Project buffers and task estimates, but they can be addressed as improvements in the way the organization as a whole addresses projects.

Quality Control

- Critical Chain is focused on the identification and elimination of the causes of performance problems. It promotes the recognition of performance problems that have systemic causes and highlights the need for addressing these above the individual project level.

Communications Planning

- Under communications requirements, resource managers must know the status of the Critical Chain plan in order to make correct decisions on the priority of resource assignments. That is the buffer management.

Procurement Planning

- Make or buy analysis is done, not with traditional cost accounting methods, but with throughput accounting - how much is the improvement in project cycle time worth?

Vendors are encouraged to submit alternative bids that would show trade-offs among shorter cycle times, cost and risk.

5. CONCLUSIONS

Project management is not an easy task; quite the contrary is arduous and always challenged by the possibilities of noncompliance with the initial requirements of deadlines,

budgets and scope. The remarkable thing is that as there are good management practices are widespread in the business, why these problems are still occurring? And this has been a concern both for project management professionals and scholars who want to understand the reasons why these problems as they occur.

The PMBOK in recent decades has become the method most used by practitioners in project management and the guide is a set of best practices in project management. Although it has provided a significant breakthrough in project management also noted problems in this area. According to Zwikael (2009) this methodology still receives much criticism in the literature due to the inability of managers to predict accurately the costs and duration of the planning activities. Stratton (2009) argument that there is still much to be done by developing the area of project management despite advances witnessed. An alternative to the PMBOK was proposed by Eliyahu Goldratt called Critical Chain to try to contribute significantly to project management. Leach (1999) states that this methodology provides a substantial advance in continuous improvement in relation to the PMBOK and that it derives from the application of the Theory of Constraint and Statistics Theory to the project system.

Some scholars have identified what makes a project successful. These factors can be highlighted in terms of: corporate understanding of project management, executive commitment to project management, organizational adaptability, project manager selection criteria, project manager's leadership style, and commitment to planning and control purposed by (Kerzner, 1987), excellent interpersonal or soft skills was pointed out by Gillard (2009) and flexibility by Olsson (2006). However, what is surprising is that even the PMBOK and literature as a whole, recognizing the strategic importance of human resources, Belout & Gauvreau (2004) show that this factor does not have a significant impact on project success.

One of the key factors in project management is to deal with problems arising from the uncertainties that cause delays, damage estimates and affect the scope. Thinking about it,

Goldratt decided to put a protection which was called a project buffer at the end of the critical chain which represents a safety margin that will be used if needed. According to Raz et al. (2003) this buffer protects the critical chain against uncertainty in the feeding noncritical chain and its size can be adjusted if necessary.

The literature suggests three ways of wasting the protection that is placed on projects. The first is called the student syndrome and Parkinson's Law, the second is the phenomenon of multitasking, and finally, the interdependence between steps. These dependencies, according to Goldratt (1998), cause delays and advances accumulate wasted. Therefore, management of the buffer corresponds to the fundamental requirement to the success of the project.

Compared to the PMBOK, Kendall et al. (2001) states that the amount of resources of manpower planning in the critical chain is usually lower for the same work. And this can be attributed to the removal of the work consumed with multitasking and task time not dedicated. Lechler et al. (2005) also states, in analyzing the two methodologies, the main contribution was the use TOC by the CCPM that focuses on the improvement of system performance, especially in managing resources in an environment with multiple projects, however, observed that his application is more complex.

Managing a project means to meet the requirements defined in terms of time, budget and scope. And their success contributes to the organization to achieve its goal set by the shareholders. Lastly Kendall et al. (2001) suggest that certain earlier projects finishing has value to the organization well out of proportion to their cost.

One limitation that can be pointed out from this article and could be addressed as future research is an intervention in a project managed in the PMBOK methodology, using characteristics from the Critical Chain as described in the section 4. The methodology to understand the phenomenon could be the Case Study Research. The data could be collected

following the case study methodology. The case study research is based on the same traditional historical research, adding some other information sources: direct observation and interviews (Yin, 2005).

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