

The Application of Critical Chain Concept in Elena Project Guidance

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Abstract: *Critical chain project management is a new method of project management outcome the application of theory of constraints in project management and proposed by E.M. Goldartt (1997). In this method, to overcome the variability of project scheduling in execution phase, buffer management was introduced. There were several researches about buffer management (buffer sizing and buffer management system) and an acceptable performance of it against uncertainties of projects and be a valuable control tool for project control were proven. In this research first, we introduce the new project management guidance named “Elena project management guidance” provided for Iranian projects then define the application of critical chain and buffer management concept on this guidance and show how to extend it in the whole of guidance. Finally, Elena was provided based on critical chain were proven.*

Keywords: *critical chain, buffer management, ELENA project management guidance, uncertainty*

1. Introduction

In today’s highly competitive market place and rapidly changing in costumers’ demands, delivering projects on time within budget and other objectives have been increasingly considered. The main challenge of a project planning and executing is a wide range of constraints such as resource scarcity, network complexity and various uncertainties. ([7] and [8]). Traditional project schedule management methods, namely a critical path method (CPM) and program evaluation and review technique (PERT), can no longer meet the project management modern needs, so improving a new mechanism to meet such needs, is useful.

Goldartt (1997) in his new book “ the goal” applied theory of constraints to project management and introduced critical chain scheduling and buffer management (CC/BM) methodology, which has been made to the base of several researches’ works. (For example, [12], [13], [14], [15] and [8])

Critical chain is defined as the longest path in project but unlike in critical path method in which just is considered precedence relations, resource constraint is also involved in scheduling [6]. Three types of buffer were defined, project,

Feeding and resource buffer. The project buffer added to the end of critical chain to protect the project delivery date. The feeding buffer added to the end of chain feeding to critical chain to protect the delays of those critical activities affecting from chain. The resource buffer, kind of warning systems, ensures that the required resources are ready to be assigned to critical task, when is time to work [15].

The main objective of this paper is defining the application of critical chain management in Elena project guidance introduced in this paper.

The reminder of this paper is organized as follows; section 2 provides a review of literature dealing with critical chain and buffer management concept. A brief description of buffer management system and Elena project guidance are provided in section three and section four respectively. In section five, the application of critical chain concept in Elena project guidance are showed and cleared. In the last section the summary of this research is provided.

2. Literature Review

Goldartt (1997), in his new book named “the goal” referred the new idea of critical chain and buffer management (CC/BM) which is the outcome of the application of theory of constraints (TOC) to project management [5]. In [6] authors compared the traditional methodology of project management with critical chain, they referred the merits and pitfalls of critical chain. Several books were published about CCPM and cleared this idea [11] and [12]. The critical chain method was developed not only in academic societies but also some companies began to apply it in project management [3]. In [1], by a case study, was shown that by application of critical chain method in company, quality and safety of works were maximized, and time and cost were minimized.

As mentioned before buffers are in to CC to deal with uncertainty and play role as a valuable tool for project control. There are wide ranges of studies about providing a method for calculating buffer sizes. Two popular and simple buffer sizing techniques named, cut a paste method (C&PM) and route and square error method (RSEM) that respectively mentioned in [5] and [12]. Then in [16], were proposed two new adaptive buffer sizing procedures which seem to be more reliable than previous methods. There are several methods by considering the different aspects of projects and conditions could be find in literature (for example, [18], [2] and [10])

The BM system mainly follows the practice established by Goldartt (1997) for production operations. According to this system, three regions were proposed and along with buffer consuming, the region and required actions were cleared. Author in [11] questioned Goldratt’s static monitoring notion, and he recommends the two buffer trigger lines to vary linearly over the planned duration of the project considering the fact that the uncertainty might decrease as the project progresses. In [8], author put forward a new CC/BM-based schedule monitoring procedure that evaluates the probability of successful project completion relative to the cost of crashing and that determines when to expedite which activity in a cost-effective manner. An in [9] author incorporated the activity sensitivity measure into the buffer monitoring process, enabling the management team to estimate the risk of project delays on the whole and to identify high-risk activities in particular when taking expediting actions.

3. Buffer Management System

In estimating a project duration, engineers usually take account some safety time within duration of each task to come up with possible issues such as the other work they are doing, paranoia and etc. the purpose of buffer mechanism in CCPM is, removing the safety time of activity durations to eliminate student syndrome (protecting from starting late) and keeping busy for the entire activity duration according to Parkinson’s law. Then add buffers at the end of each chain which reflect the aggregate of safety times. On the other hand, buffers are calculated to protect chain against uncertainty. Three types of buffer were defined, project, feeding and resource buffer. The project buffer added to the end of critical chain to protect the project delivery date. The feeding buffer added to the end of chain feeding to critical chain to protect the delays of those critical activities affecting from chain. The resource buffer, kind of warning systems, ensures that the required resources are ready to be assigned to critical task, when is time to work.

CC/BM provides not only an effectively approach to make robust scheduling in planning phase but also offer an advantageous control tool to cope with schedule variability in execution phase. Buffer determined in planning phase, act as a criteria to monitor and control project. Buffer monitoring detects schedule deviations and alerts to plan and or take appropriate actions in the project implementation actions.

In buffer mechanism, the system is divided in to three regions and two trigger points:

1. In The green region, take no action
2. In the yellow region, assess the problem and plan for action
3. In the red region, initiate action.

- 2) Concepts: 'Elena Project concepts' refer to the next aspect following principles. Concepts portray a view of project management and directing and they are applied in different phases of the project life cycle by the processes.
- 3) Processes: processes refer to the step by step progress of the project throughout its life cycle, i.e. from the very beginning to the ending point of the project. Each process constitutes multiple sub-processes that follow a specific goal during the lifetime of the project. In this guidance, there are eight processes representing a set of sub-processes required for the successful management and leadership of the project.
- 4) Tools: as one of the eight facets of the Elena Project, tools are used for achieving the results and implementing the measures required for the management and leadership of the project.
- 5) Tailoring: it refers to the fifth facet of the Elena Project; it allows the Elena project guidance to be used for all projects of any size, scope, executive maturity, complexity, geography, and other distinctive features.

4.2. Project Management Structure

Elena project guidance provides project management structure with four levels, three of which represent the project management team and the fourth which sits outside of the project.

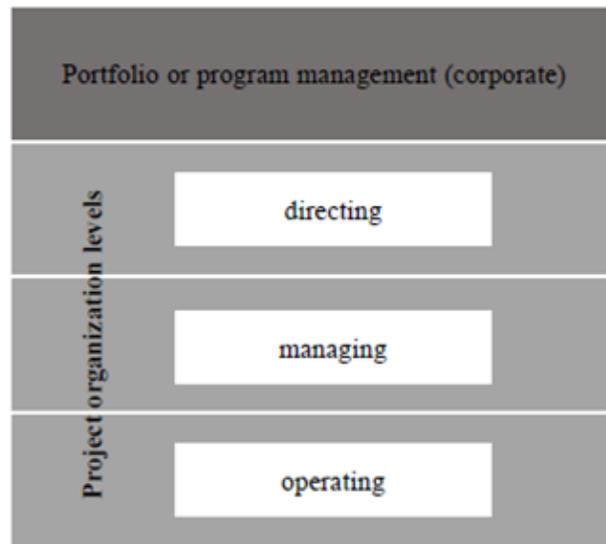


Fig.3. The Four Levels of Project Organization

According to the figure, the level of portfolio or program management is the first level and places outside of the project and the other levels, respectively directing, managing and operating, construct the project management team. For each level, a clear description of responsibilities, goals, limits of authorities, skills, knowledge and experience required for all roles were determined and delegated. Based on control mechanism set, the level of delegating authority makes sure about the correctness of progression in the next layer.

Two kinds of controls were referred in this guidance:

- 1) Time driven control: in this kind, the level of delegating authority is informed the progress of project by reports predefined periodic intervals and according with, takes decisions and delegates the authorities of next level.
- 2) Event driven controls: this kind of controls, takes place when a specific event occurs. This could be for example the end of project or exception report which is should be provided and submitted to the level of delegating authority.

If an issue which decision making in response to is beyond the delegating authorities occurs in each level, in this situation, that issue should be reported to the upper and proper level to make decision. According to Elena project management, this kind of issue is called an exception.

5. The Application of Critical Chain Concept in Elena Project Guidance

Due to the existence of uncertainty in projects, changes are assumed to be inherent in all project plans during the execution phase. Therefore, the concept of buffer from critical chain method has been used in Elena Project Management Guidance and generalized in the project organization in three levels, namely directing, managing, and operating, to cover such changes. Accordingly, a buffer called 'authority limits' is delegated to each level for both deciding on project changes, stages, or work packages (depending on the level) and coping with variability. 'Authority limits' is typically determined according to five performance objectives of a higher level including scope, time, cost, quality and risk, and it is delegated to a lower level as well. Put it another way, five types of buffers are determined for each level.

The delegated 'authority limits' is a basis for planning and decision making about the changes occurred in each level. According to the control mechanisms, the delegating level may learn about the extent of utilizing the limits of authority delegated and the state of its duties and may communicate the necessary warnings, as required. In the event that an issue occurs in the project and when decision making in a level is likely to exceed over the extent of the buffer allocated to that level, i.e. the authority limits, it simply means that an exception occurs, hence it is reported to a higher level for decision making.

Authority delegation and exceptions management are considered to be the principles of Elena Project Management Guidance, leading to the efficient use of senior management time. The workloads will be efficiently distributed among the project organization levels by appropriately determining the authority limits and its delegation to the lower levels. Control mechanisms may enable each level to be informed of the progress and the state of duties at its lower level, subsequently; the decisions are likely to be made at the appropriate level of the project organization based on the delegated authority limits. Consequently, project ceasing and reduced project progress are firmly avoided.

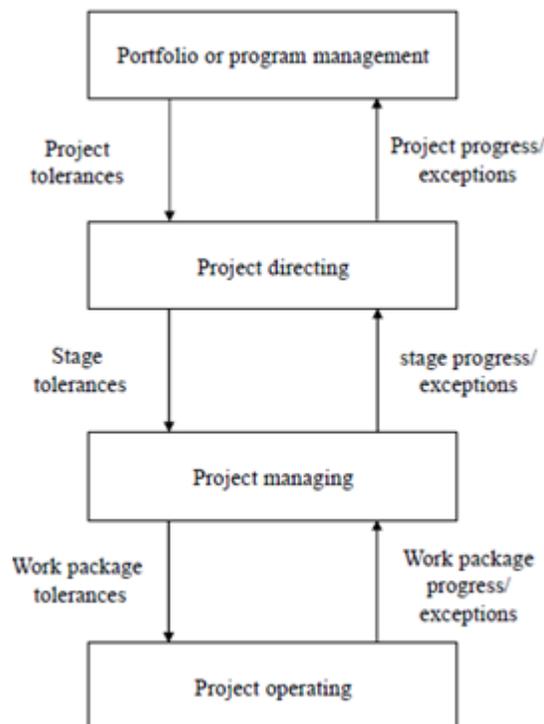


Fig. 4 Decision Making Tolerances in Project Organization Structure

6. Conclusion

In this paper, the critical chain method proposed by E.M. Goldratt and Elena project guidance prepared to guide Iranian projects were checked, based on this check, we identify some similarities between control mechanism and authority delegating provided in Elena and buffer management in critical chain. Then a comprehensive description about the application of critical chain and buffer management concept were explained and were shown how to extend it in the whole of the guidance. So it has proven that Elena was implemented based on critical chain concept. The future research should be develop some sections of Elena as like as planning and progress concept by considering the critical chain method.

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