Proposal for introduction of the cost variable in time management using critical chain methodology

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Abstract

This project introduces the cost variable inside the critical chain methodology at project management. To achieve this goal, it is developed a bibliographical survey, followed by the definition and classification of two types of costs: Static and Dynamic. After that, two new definitions are made: cost critical chain, which is the sequence of activities with higher dynamic costs; and cost buffer, that guarantees the security of the project with the consideration of the uncertainties of the cost of the activities. Finally, it is shown how to use this proposal, through the explaining of the planning and control of the project in this new context.

Key words:

Project Management, Critical Chain, Cost management

Introduction

Despite the Critical Chain Methodology, proposed by Goldratt¹, is relative new, it has gained attention at the project management context, according to Tian, Zhang and Peng².

Since that many authors, like Rasdorg and Abudayyeh³, defend the necessity to integrate the time variable with the cost in this environment, this work seeks to do this to improve the planning and control of a project, basing on the Critical Chain Methodology.

Results and Discussion

At first, it was developed a bibliographical survey, which resulted in the classification of two types of cost: Static and Dynamic. The first refers to the cost that are inherent to the activity, which are necessary to initiate it, causing no variations in the budget, if the activity is delayed. The second affects the budget depending on the duration of the activity, being the budget's restriction. Then the cost of an activity is given by equation 1.

$$Cost_{activity}(\$) = Cost_{static}(\$) + t_{activity}(t) * Cost_{dynamic}\left(\frac{\$}{t}\right) \quad (Eq. 1)$$

As there is a restriction in the budget, it is possible to find a path, that if the project management follow it, he will have a greater probability to satisfy the initial budget; this path is the sequence of the activities with higher dynamic costs. Then, this is called the cost critical chain. At Figure 1, it is possible to compare the traditional critical chain to the one proposed.

Following this direction, it is defined by the recommendation of Leach⁴ that the cost estimative of the activities is given by the three-point analysis, as it is shown by equation 2.

$$C_{plan} = \frac{C_{optimist} + C_{pessimist} + 4 * C_{recomendado}}{6} \quad (Eq. 2)$$

Through these logic, it is defined the concept of cost buffer, shown in equation 3. This is given by the sum of all uncertainties linked with the total cost of all the activities, since that every activity impacts at the final budget.

$$Cost_{buffer} = \sqrt{\sum_{i=1}^n \left(\left(\Delta C_{ativn} \right) * t_{plan_{ativn}} \right)^2 + \left(C_{d_{plan_{ativn}}} * \Delta t_{ativn} \right)^2 + \left(\Delta C_{s_{ativn}} \right)^2} \quad (Eq. 3)$$

After this explanation of the planning phase of this methodology, it was developed the control phase, using both critical chains. When the progress of the project is followed, it must be prioritized the buffer that is more consumed, however when both consume are the same, it must be prioritized the project's scope. When the consume of the buffer is less than one third of its capacity, there is no need to do something. When it is between one third and two thirds, it must be developed a control plan. Finally, when it is more than two thirds, this plan must be putted into action.

Figure 1. Comparison between both critical chains.

Conclusions

After analyzing the initial objective, it is possible to affirm that this goal was achieved with this Project, because the cost variable was introduced in the Critical Chain Methodology.

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¹ GOLDRATT, E. M. Corrente Crítica. São Paulo, Ed. Nobel; 2ª ed, 2014.

² TIAN, Z.; ZHANG, Z.; PENG, W. A Critical Chain Based Multi-project Management Plan Scheduling Method. 2nd International Conference on Industrial and Information Systems, p. 304-308, 2010

³ RASDORF, W J.; ABUDAYYEH, Osama Y. Cost- And Schedule- Control Integration: Issues and Needs. Journal of Construction Engineering and Management, Vol. 117, No.3, 1991.

⁴ LEACH, L. P. Schedule and Cost buffer sizing. Advanced Projects Institute; Boise, Idaho; dec. 2002.