

**A RESEARCH ON EFFECTS OF USING SIX SIGMA, THEORY OF  
CONSTRAINTS AND ACTIVITY BASED COSTING AS  
INSTRUMENTS FOR SUCCESSFUL MANAGEMENT OF FIRMS  
ACTIVITIES**

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**ABSTRACT**

*This study prepared on the need of management for tools that can be help on making rapid, proper and well timed decisions for managing activities of firms, keeping it's processes current and to be more vigorous in competition. For this aim we have considered three powerful techniques that they have a wide application area on different issues of manufacturing and services. These techniques are Six Sigma, Theory of Constraints and Activity Based Costing. All of the mentioned techniques are separate and distinct from each other but taking up these techniques altogether creates a synergy and put into effect an indispensable tool for managing and directing their company. All of these techniques have a comprehensive usage of mathematical and statistical issues and necessitates in depth data analysis. In this study we give a brief description and show the powerful sides of each three. Later the way of bringing these three techniques side by side has shown in an application.*

**Keywords:** Management, Decision Making, Six Sigma, Theory of Constraints, Activity Based Costing, Statistical Data Analyses, Process Improvement.

**1. INTRODUCTION**

The first wave of business- process management, outlined in Frederick Taylor's theory of management in the 1920's, suggested that processes were implicit in work practices, tucked away in policy manuals. Process management was called "method and procedures analysis". The second wave, ushered in over the past decade, suggested that processes could be manually reengineered through a one-time activity. Changes were made, but essentially cast in concrete in software, such as the feature-rich but rigid ERP applications. Even with document- centered workflow added to financial- management systems, for example, these applications rarely gave business managers full control over the process life cycle. The third wave of BPM enables companies and workers to create and optimize new business processes on the fly. Change is the primary design goal. Through agile business processes, value chains can be monitored and continuously improved. The third wave is not business- process reengineering, enterprise application integration, workflow management or another packaged application- it's the synthesis and extension of all these technologies and techniques into a unified whole. The third wave BPM becomes a new foundation upon which to build sustainable compatible advantage.

## 2. MANAGEMENT TECHNIQUES

### 2.1. Activity Based Costing

ABC, on the other hand, focuses on activities performed in manufacturing the product. ABC is defined by Computer Aided Manufacturing-International (CAM-I) as “the collection of financial and operating performance information tracing the significant activities of the firm to product costs” [1]. ABC is a concept in which overhead is assigned to products based on the number of activities consumed by the products [2]. Liggett et al. states the underlying philosophy of ABC as follows: Certain activities are carried out in the manufacture of products. Those activities consume a firm’s resources, thereby creating costs. The products, in turn, consume activities. By determining the amount of resource (and the resulting cost) consumed by an activity and the amount of activity consumed in manufacturing a product, it is possible to directly trace manufacturing costs to products” [3].

### 2.2. Theory of Constraints

The Theory of Constraints (TOC) is a system’s management philosophy developed by Eliyahu M. Goldratt. In his book, *The Goal: A Process of Ongoing Improvement*, Goldratt states that a firm’s goal is to make money now and in the future. A company will not exist if it is not making money. Any activity that does not help make money is a waste of time and resources [4]. TOC is implemented through three measures: throughput, operating expenses, and inventory [5].

The Theory of Constraints (TOC) can be organized into the following components:

- Performance measurement: sound financial and operational performance measures to measure the performance of the system relative to its goal, however that has been defined.
- Performance improvement using one of the following:
  - Constraint management using the five focusing steps in the process of ongoing improvement, including the notions of buffer management.
  - Problem solving/TP: tool for problem solving.

Problem solving has the objective of answering three essential questions as the following: a) what to change? b) What to change to? C) How to successfully cause the change?

<b>Problem Solving Questions</b>	<b>Sufficient Cause Application Tools</b>	<b>Necessary Condition Application Tools</b>
What to change?	Current Reality Tree	Evaporating Cloud
What to change to?	Future Reality Tree	Prerequisite Tree
How to successfully cause the change?	Transition Tree	

*Figure 1. Thinking Processes and Application Tools*

### 2.3 Six Sigma

Six Sigma is the disciplined methodology of defining, measuring, analyzing, improving and controlling the quality in all of a company’s products, processes, and transactions with the ultimate goal of virtually eliminating defects.

The Six Sigma process builds and rewards knowledge workers. It is inherent in the aspects of process management and process improvement. Knowledge workers are in the business of finding and relating knowledge. They are also responsible for collaborating to improve knowledge in their organization.

To deploy Six Sigma effectively, organizations have to turn all employees into knowledge workers, which require the development of a system that incorporated all four facets of profound knowledge. Thus a Six Sigma culture needs a way to produce Six Sigma knowledge. When Six Sigma principles are applied to customer service, all variances from the ideal level are defects in the service. A discrete bit of customer service could be an interaction with a customer service agent, or a self-service

interaction on the web. Knowledge-Centered Support is a disciplined methodology to capture, structure, improve, and reuse knowledge that is gained through the customer service experience with the goal of delivering the highest quality service to the customer, thereby reducing costs.

### 3. Combining Management Tools

Discovering innovative ways to improve business processes is now recognized as the path to business agility and competitive advantage. It's something companies are desperately seeking to achieve as they attempt to adapt to the current business and competitive landscape. The strategy that big firms are chasing is not the piecemeal replacement of old processes with new, but a single program, the establishment of a capability for implementing and managing a continuous stream of business process innovations. [6]

Business process innovations are a must for today's manufacturing and service firms. Nowadays we can see or hear a lot of implementation stories of new management tools. Activity Based Costing is one of them. Traditionally, the costs of manufacturing a product have been categorized as direct material, direct labor, and overhead. Traditional cost systems, also called volume based cost systems (VBC systems) trace overhead costs to the product based on the assumption that products cause the costs. Very few allocation bases have historically been used. The most common allocation base used in VBC is direct labor hours. The amount of overhead allocated to a batch of products increases linearly with the volume produced. So, it is assumed that as volume of output increases, direct labor hours increase in a linear fashion [7].

All of the mentioned techniques give amazing results when implemented in the right way. The issues that we want to mention here are the results that we can achieve if we use an integrated structure of these techniques together. We can use Activity Based Costing and Theory of Constraints in the project selection of six sigma as well as the project implementation steps of projects. For firms that are using Activity Based Costing the activities with the higher costs can be considered as potential projects that must be handled as six sigma projects. In an IT firm activity based costing approach has been implemented partially for following sales and expenses of the cost and profit centers of the firm. The main three cost burden for this company are human resources, transportation and inventory. These three factors have analyzed for every department and the departments that have the highest cost rate have handled as a potential six sigma project.

Also six sigma projects address three different areas of potential improvement: quality, cost and schedule. Critical characteristics in the product, process or service are identified using CTQ's. In the situation that you have determined the area of the problem that you must handle, you have to give priority to the CTQ than CTS and CTC.

*Table 1. Throughput priority of CTx projects that affect the constraint [8]*

<b>Project Type</b>	<b>Definition</b>
CTQ	Any unit produced by the constraint is especially valuable because if it's lost, additional constraint time must be used to replace or rework it. Because constraint time determines throughput (net profit of the entire system), the loss far exceeds what appears on scrap and rework reports. CTQ projects at the constraint have very high priority.
CTS	CTS projects can reduce the time required for the constraint to produce a unit, which means that the constraint can produce more units. This directly affects throughput. CTS projects at the constraint have very high priority.
CTC	As the constraint determines throughput, the constraint's downtime results in lost throughput for the entire system. This makes the cost of constraint downtime extremely high. The cost of operating the constraint is usually miniscule by comparison. Also, CTC projects often have an adverse effect on quality or schedule. Thus, CTC projects at the constraint are low priority.

Also on problem analyzing phase and problem solving phase, thinking processes of theory of constraints can help more than SIPOC analysis.

#### **4. CONCLUSION**

This study gives brief summaries about each of the most used techniques. All of these techniques have comprehensive applications in both manufacturing and services fields. They have advantages and disadvantages. All have obstacles to overcome. This paper shows the potential of bringing together of these three techniques.

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