Chapter I

Introduction

1.1 Research Background and Motivation

According to many studies of Standish Group[1] that collects case information on real-life IT failures and environments in West Yarmouth and Massachusetts with respect to traditional project management (PERT/CPM), they found that:

- merely 44% of projects finish on time,
- many projects usually complete at 222% of the duration which was planned at the beginning, expend 189% of the original budgeted cost, 70% of projects fall short of their planned scope (technical content delivered), and 30% are cancelled before the project completion.

On the other hand, in their research Critical Chain Project Management (CCPM) users report 95% on-time and on-budget completion when CCPM is applied correctly.

Critical Chain Project Management (CCPM), Developed by Eliyahu M. Goldratt, is based on methods and algorithms derived from his theory of constraints. The idea of CCPM was introduced in 1997 in his book, *Critical Chain* (Goldratt , 1997). Application of CCPM has been credited with achieving projects 10% to 50% faster and cheaper than the traditional methods (PERT/CPM) developed from 1910 to 1950's. As traditional project management methods, 30% of the lost time and resources are typically consumed by inefficient techniques such as multi-tasking, student syndrome, and lack of prioritization.

In project management, the critical chain is the sequence of both precedence- and resource-dependent terminal elements that prevents a project from being completed in a shorter time, given finite resources. If resources are always available in unlimited quantities, then a project's critical chain is identical to its critical path (Leach, 2002).When there is a tie for the longest path, in which case there is more than one candidate for critical chain, the choice is typically arbitrary (Herroelen and Leus ,2005).

In order to protect the critical chain, concept of buffers was introduced. There are three types of buffers, namely, project buffer, feeding buffer and resource buffer. A project buffer is added to the end of the critical chain to protect the project delivery date. Feeding buffers are added to all paths which are feeding into the critical chain so as to prevent the delays on those paths from affecting the on-time start of critical tasks. Resource buffers are characterized as warning systems which make sure the resource are ready when it is time to work on critical task. The difference between resource buffers

[1]The Standish Group International, Inc.: http://www.standishgroup.com/index.php

and two aforementioned buffers is resource buffers are not time buffer added to project. Moreover, they do not change the planned time of the project (Goldratt, 1997).

Under multi-project environment, company constraint resource limits the number of projects which the organization can execute. CCPM for multi project environment has to prioritize to determine the sequencing of subproject by capacity-constraint resource also called drum resource. By means of TOC, capacity-constraint resource must be kept busy. Furthermore, while critical chains are protected form common cause variation by using project buffer, feeding buffer and resource buffer, capacity-constraint resource is protected from common cause variation by means of a capacity-constraint buffer (Cohen, Mandelbaum, and Shtub, 2004; Leach, 1999).

Obviously, the size of buffer has a significant impact on the project schedule. It might create new resource contentions, and it might even change the longest path. There are two simple sizing approaches suggested for project buffer and feeding buffer in the literature; the cut and paste method (C&PM also called 50% rule) and the root square error method (RSEM) (Tukel, Rom, and Eksioglu, 2006; Herroelen and Leus, 2001; Leach, 2004; Newbold, 1998). Nevertheless, none of these papers have apparently mentioned to capacity-constraint buffer sizing approach which plays the important role in multi-project environment. Besides, there are ,however, some research papers which examined and illustrated CCPM under multi-project environment (Cohen, Mandelbaum and Shtub, 2004; Leach,1999), those papers assumed all the subprojects were identical. Despite the fact that such situation is impractical.

1.2 Research Objective

As mentioned before, Capacity-constraint buffer sizing approach is an essential portion of Critical Chain Project Management (CCPM) under multi-project environment, however, there are not any researches papers which talked about capacity-constraint buffer sizing approach and implement seriously.

According to computing project buffer and feeding buffer sizing, C&PM and RSEM were presented. In 2004, C&PM 50% was used for calculating capacity constrain buffer by each of subprojects is identical by Cohen, Mandelbaum and Shtub. (Cohen, Mandelbaum and Shtub, 2004)

In this dissertation, C&PM which not only 50% but also adjust percent to be 40%, 30%, 20% and 10% was applied in calculating project buffer , feeding buffer and capacity constraint buffer size under multi-project environment. Moreover, we use RSEM to compute the project buffer, feeding buffer and capacity constraint buffer so as to contrast its result with C&PM.

Our experiment could be separated into two main cases, namely, all the subprojects are identical and all the subprojects are different. Furthermore each case has been divided up into three levels (Low, Medium and High) by using subproject parameters, Number of activities (n), Order Strength (OS), Resource Factor (RF) and

Resource Constraintedness (RC) to divide them. Then, we will observe and make comparison master project due date corresponding with buffer sizing approaches.

1.3 Research Scope

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (Project Management Institute, 2004) is a project management standard developed by the nonprofit Project Management Institute (PMI).

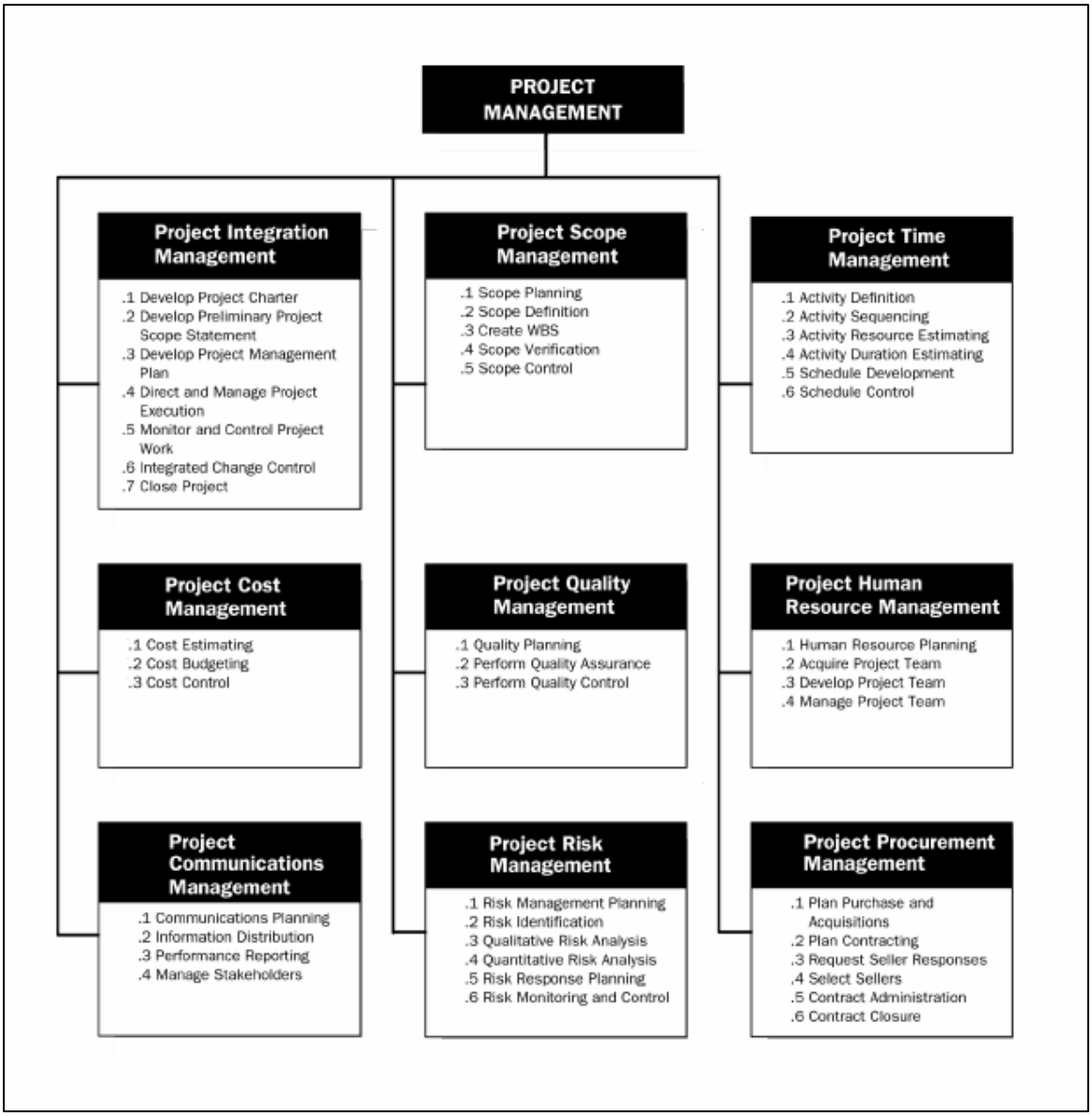

Figure 1-1: Overview of Project Management Knowledge Areas and Project Management Process (Adapted form PMBOK® Guide 3rd Edition page 11)

The PMBOK® Guide is widely accepted to be the standard in project management; it recognizes 9 knowledge areas typical of almost all projects, that is:

- Project Integration Management.
- Project Scope Management,
- Project Time Management,
- Project Cost Management,
- Project Quality Management,
- Project Human Resource Management,
- Project Communications Management,
- Project Risk Management, and
- Project Procurement Management.

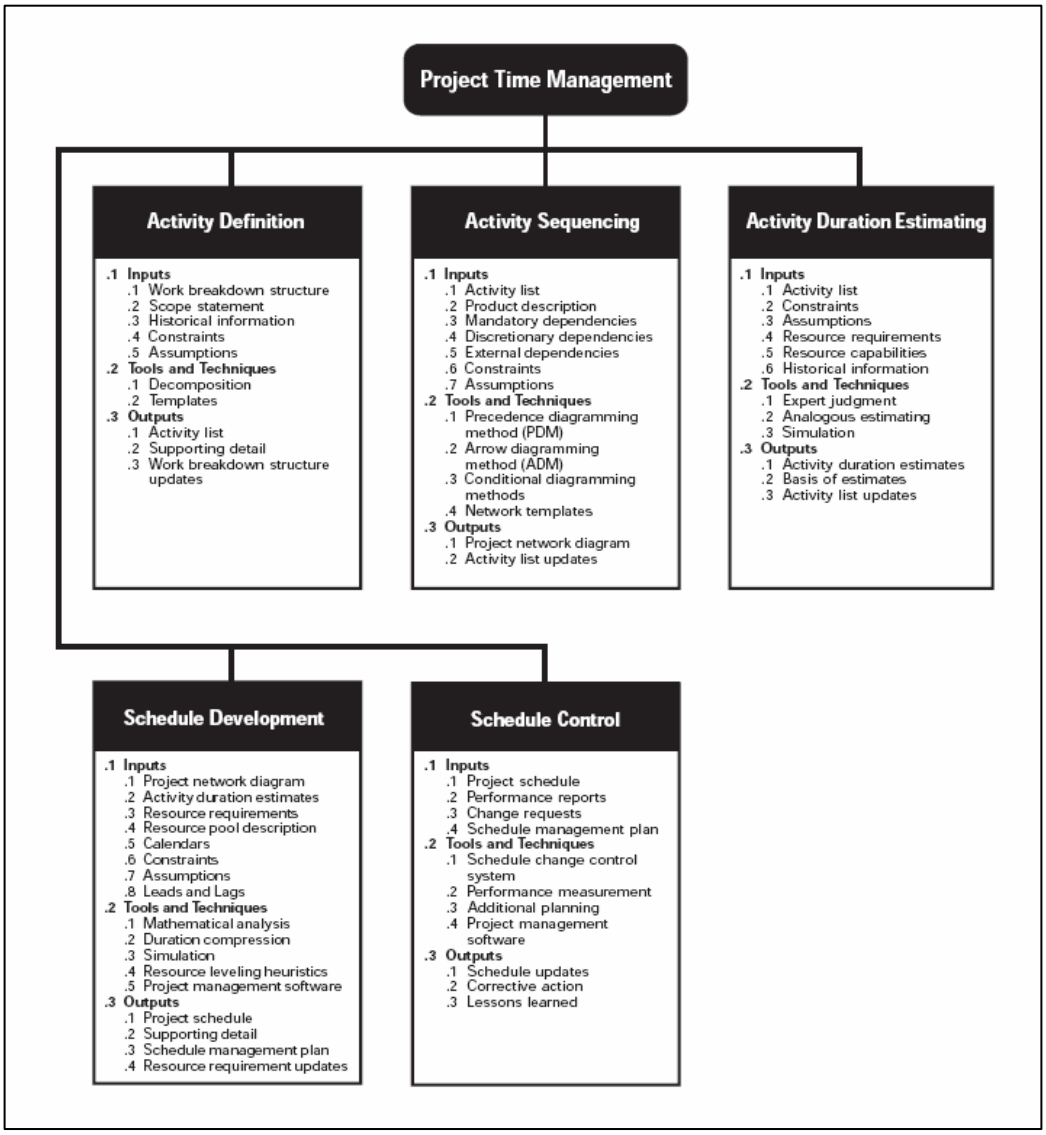

Figure 1-2: Project Time Management Overview
(Adapted form PMBOK® Guide 3rd Edition page 125)

Project time management is a critical aspect of any project; if project success is to be achieved, a time management system must be used. Project time management including defining the activities necessary to produce the project scope, sequencing the activities, developing the project schedule, and controlling the project to schedule.

This research will cover the inputs, tools and techniques, and outputs of the project time management processes that deal with defining project activities, sequencing project activities by using critical chain project management, and unraveling resource conflict problem.

1.4 Organization of Dissertation

This dissertation contains five chapters, and is organized as follows:

The first chapter, Chapter I, deals with the following topics with respect to overall aspect of dissertation which is composed of 1) research background and motivation, 2) research objective, 3) research Scope and 4) organization of dissertation.

Chapter II makes a survey of the literature on Project Management, with emphasis on Critical Chain Project Management (CCPM). In particular, this chapter focuses on literature that addresses undesired effect of traditional project management, critical chain project management theories, critical chain project management (both single project and multi-project management) and project buffer and feeding buffer sizing approaches.

Chapter III is devoted to the description of the research Framework and model, research methodologies and tools, steps of the research process, expected research outcomes and research limitations respectively.

Chapter IV is devoted to show the research results

Chapter V concludes this dissertation with overall conclusions and suggestions for the further research.