CHAPTER I

INTRODUCTION

1.1 Problem and Motivation

Software development effort estimation plays a significant role in project management [1] [2], especially in planning phase of software development life cycle [3]. Over three decades, there have been many published research endeavors in effort estimation. Yet it is still a challenge for researchers to increase accuracy of software effort estimation. In a typical project management, over-estimation may result in a lost bid, while under-estimation may not only lose profits but also fail the project. Thus, a large number of software development effort estimation models have been proposed to improve effort prediction accuracy. However, they often focused on overall effort estimation which furnishes no detailed breakdown of individual project activity and phase estimation.

"Phase-wise" project effort estimation is an effort estimation of each development phase of a software project which provides information necessary for project manager to trace various project activities that consume efforts being spent on a particular phase. This is attributive to project outsourcing where each development phase may be distributed to different organizations. In order to accommodate such wide arrays of project activities, artifacts, and especially personnel involvement, project managers need to have an efficient tool or technique to account for all variations in monetary term. Thus, it is essential to convert the estimated efforts to currency because each phase requires different development staff expertise of different salary levels [4]. In addition, managers or estimators must spend their considerable time and efforts on collecting *"features"* (refer to software size/effort drivers/cost drivers in software engineering, explanatory variables/predictor variables/independent variables in statistics, and input variables in machine learning) of software projects for estimating the software effort. It is cost effective if a small numbers of features are required for the estimation. As a result, this research tries to find only relevant features to accomplish the task.

1.2 Objectives

The objectives of this dissertation are

(1) to reduce features for software development effort estimation, and
(2) to establish phase-wise software development effort estimation whereby arriving at finer grained and more accurate results.

1.3 Scope and Limitations

The following issues are considered in this dissertation:

(1) The "phase" refers to software development phases of sequential process models (i.e., Waterfall and V-model) ranging from planning to transition phase.
(2) Only small number (38 projects) of historical project data are used in the experiment due to
(2.1) the project data are trade secret of software companies that is difficult to be disclosed, and
(2.2) collection of the project data must be done at proper intervals since it is disruptive for developers and project managers being interviewed.

Bearing the above limitations in mind, the thirty eight projects are deemed reasonable numbers for effort estimation area, as there are several forerunning standard data sets in PRedictOr Models In Software Engineering (PROMISE) repository [5], COCOMO-SDR, KEMERER, TELECOM, ALBRECHT, and ISBSG10 data sets.

1.4 Contributions

This dissertation contributes to software project management as follows:

(1) Identifies important features to be used for software effort estimation.
(2) Provides a phase-wise software effort estimation model to predict software effort of each development phase.
(3) Offers a total software effort estimation approach to estimate software effort of the entire development life cycle.

1.4 Dissertation Organization

This dissertation is organized as follows. Chapter II provides background and related work. Chapter III describes the methodology of phase-wise project effort

estimation. Chapter IV explains experimental results and discussion. The conclusion is discussed in the last chapter.