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Planning Engineers' Estimates on Labor Productivity: Theory and Practice

Serdar Ulubeyli[a,]*, Aynur Kazaz[b], Bayram Er[b]

[a]*Department of Civil Engineering, Bulent Ecevit University, 67100, Zonguldak, Turkey*
[b]*Department of Civil Engineering, Akdeniz University, 07058, Antalya, Turkey*

Abstract

In construction projects, there are three basic planning elements: time, cost, and quality. These concepts are in a close relationship with each other. Labour productivity is also a key concept of construction planning efforts and has a direct interrelationship with the triple constraint mentioned above. The present study reports an investigation of construction labour productivity described as numerical values, i.e. man-day values. First, a general knowledge was given concerning the concept "labour productivity". Here, the system which is the source of labor productivity rates in Turkey was also introduced and its criticism was carried out. Toward this aim, labour productivity rates of the most fundamental two work items of any construction project (formwork-erecting and reinforcement-fixing) were obtained by means of a questionnaire survey applied to planning engineers, site/project managers, and chief executive officers of about 82 general contractors in the construction industry in Turkey. The results were evaluated by one sample *t*-test, and hence, today's situation of the construction industry in Turkey regarding labor productivity was displayed by a statistical analysis that compares man-day values in theory and in practice.

Keywords: Constuction planning; estimating; labor productivity; project management; Turkey

* Corresponding author. Tel.: +90-372-257-4010; fax: +90-372-257-4023.
*E-mail address:*serdar.ulubeyli@karaelmas.edu.tr

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1. Introduction

In a construction project, there are three main elements that should be determined and continuously observed in planning efforts throughout the project from proposal preparing to delivery. As shown in Fig. 1, these interacting elements called "triple constraint" are time, cost, and quality. Here, labor productivity is a key intermediate concept that has a potential to affect all of these elements and that should be taken into account in understanding the possible interactions between them.

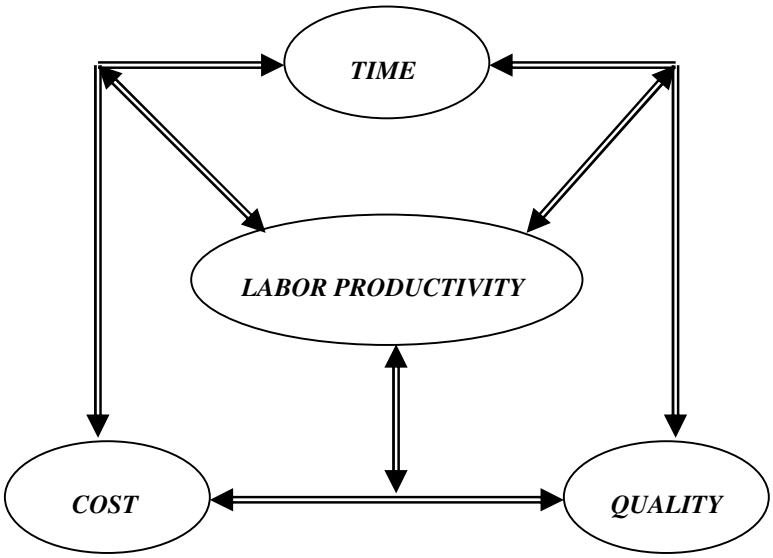

Fig. 1. Main elements in construction planning.

Resource assignment decisions made in the activity level control the total time and cost schedules of a project. Project resources are divided into three factors: labor, material, and equipment. Among them, labor-based productivity rates called as man-day values are used in estimating time and cost of activities. In fact, these values constitute a theoretical baseline for general contractors and subcontractors while establishing quantity-based variables such as the number of workers needed throughout the project, the length of their working times, and the corresponding budget. Workers' working times obtained by productivity rates also reveal the optimum total project duration through induction. Of course, this total duration can be determined by negotiating with client. Even in this case, the duration needed to complete each activity can be calculated by these rates, considering cost and resources together. However, it should be importantly noted that labor productivity which has a very strong impact on project time and cost can vary in a wide interval. Another field where the productivity values are used is the observation and evaluation of labor performance. Such a productivity analysis is based on a comparison of current productivity values with past data experienced in previous projects.

Therefore, in this study, man-day values which are needed in construction planning and controlling were first determined, and then, a comparative evaluation based on Construction Unit Price Analyses (UPA) was made. In Turkey, the unit price system of the Ministry of Public Works is used in preparing tender documents and in planning all production stages of public buildings. The system is also employed in private works with some changes and supplements. UPA (Akcali, 2013) are published every year as a book. From year to year, only a few new work items are added, and some old and unused ones are removed. However, all input and unit prices are changed regularly. It is expected that man-day values in UPA differ a little from those in the job-site in normal conditions. However, in the last decade, it has been discussed that there is a considerable difference between productivity rates in practice and in UPA. In fact, changes in these rates are an expected outcome because of the