Current State of Highway Projects Planning and Scheduling

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ABSTRACT

Highway projects involve huge capital investments and prolonged durations. A number of researchers have developed various computer-based tools and techniques to help planners prepare plans and schedules based on their specific needs. CPM is the predominant scheduling method used in construction industry. However, its inability to efficiently plan and schedule repetitive projects such as highways has widely been recognized. Linear scheduling method on the other hand, was specifically designed and developed for repetitive projects. The aim of this paper is to study various planning and scheduling methods discussed in the literature and evaluate their suitability for highway projects. On the basis of literature study, location based planning utilizing linear scheduling method seems to be the most logical and efficient way of planning highway projects for various reasons discussed in the paper. It is however a new concept and therefore has limited use in practice.

Keywords: Highway Planning, Line of Balance, Location Based Scheduling, Repetitive Projects, Scheduling

1. INTRODUCTION

A lot of emphasis is laid on highway development and expansion by the emerging countries for their rapid economic growth. Road transportation being the most basic and essential form of transportation, provides quick, cheap, safe, and mass movement of people and goods. Due to the massive cost involvements and large construction periods, proper planning and scheduling of highway projects is vital for their success. A good project plan not only ensures timely completion of work and within budget, but also takes care of the other requirements like quality control and continuous resource

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engagement. Information technology is also widely utilized in the process of planning and scheduling large construction projects especially in improving communication among various stakeholders (Jaafar & King, 2011; Kulturel-Konak, Maurer, & Lohin, 2010).

Literature suggests that a number of planning and scheduling methods have been developed and used in highway construction projects. This leads to confusion in the minds of project planners with regard to the choice of method for their specific needs. An ideal plan may be one which is (1) easy to prepare and understand, and at the same time, (2) complete, efficient, workable, and practical. Aim of the study was to assimilate various highway planning and scheduling methods available in the literature, and study their strengths and weaknesses to bring out the most suitable one.

Construction projects are classified into many types based on their specific characteristics with respect to their planning needs. One of the classifications divides them into linear and non-linear. Linear projects involve activities that are carried out along the length of the project. Highways, railways, tunnels, pipeline, etc. are examples of linear projects. A typical building construction falls into the non-linear category. Another type of classification divides projects into repetitive and non-repetitive. Repetitive projects involve activities that repeat from unit to unit. Examples include a multi-storey building, a multiple housing scheme, a highway etc. Such projects will have the same set of activities repeated in every storey or in every house or at many locations. On the other hand, a construction project involving a set of discrete activities to be carried out in a pre-defined order may be classified as a non-repetitive project. An individual house construction is an example of a non-repetitive project. Repetitive projects can be related with manufacturing assembly lines where the product flows across stationary labor and equipment, though in a construction project, it is the labor and equipment which move across the stationary building, highway etc. being constructed (Yang & Ioannou, 2004). A highway project is both linear and repetitive.

Although the total number of tasks in a highway project is smaller in comparison to that in a commercial building project, proper sequencing and scheduling of activities is crucial for keeping resources engaged, thereby not allowing any idle crew time. As heavy machinery is expensive and difficult to move around, work continuity has a major impact on the overall cost and duration of highway projects. The task list in a typical highway project would broadly include: site clearing, excavation, construction of retaining structures, construction of cross-drainage structures, embankment filling, construction of side drains, and construction of pavement layers. The tasks are further divided into several activities for detailed planning and scheduling (Arditi & Bentotage, 1996).

The planning process for highway construction involves a variety of information on design elements and construction techniques in the form of drawings, topographic maps, geological reports, labor availabilities and equipment productivities etc. A highway planning and scheduling system should therefore be capable of acquiring, storing and managing this vast pool of data apart from having other analytical and modeling capabilities (Min An & Ahmad,