MULTIOBJECTIVE OPTIMIZATION OF ROAD CONSTRUCTION PROJECT TIME-COST-QUALITY TRADE-OFF USING GENETIC ALGORITHMS

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ABSTRACT

In a construction project, there are two main factors, such as project duration and project cost. These are depended to each other. The activity duration is a function of resources (i.e. crew size, equipments and materials) availability. On the other hand, resources demand direct costs. It means if activity duration is compressed then that leads to an increase in resources and so that direct costs. But, project indirect costs increase with the project duration. In general, for a project, the total cost is the sum of direct and indirect costs and exists an optimum duration for the least cost. Hence, relationship between project time and cost is trade-off [1].

In today´s market-driven economy, the ability to minimize the time and/or cost of a project could determine the profitability and even the survival of a construction company. The increasing acceptance of alternative tenders and different project delivery systems, such as design and build, management contracting, build-operate-transfer, partnering, etc., allows greater flexibility in construction duration. This also means that both construction time and cost should be considered concomitantly at the estimation and planning and stages [1].

Quality is an important parameter correlating highly with time and cost parameters. But it is not a quantitative parameter in nature, practical time-cost-quality trade-off models are seldom developed from previous research works of the literature. Although the objectives of cost and time might be mentioned frequently by natural numbers, the objective of quality is seldom described in quantities, which worsens numerical trade-off among project time, cost, and quality [2].

The construction management involves everything related to planning, monitoring and controlling of the project. A perfect project involves minimal time, low cost and high quality: clearly this is not always possible and if problems show up during the work, the Management must be ready to intervene by changing the relationship between the vertices of the “magic triangle” [3].

The paper presents a multiobjective optimization approach for the planning and scheduling of an infrastructural construction work, with the aim of optimizing time-cost-quality simultaneously. The purpose is to provide decision-makers to obtain good solutions for project duration, cost and incorporating quality with minimum function evaluation.

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