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Quantification of social costs associated with construction projects: state-of-the-art review

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Abstract

Communities that surround an operating construction site often find themselves subjected to negative impacts such as annoyances and economic losses. The latter often called "social costs", refer to the monetary equivalent of consumed resources, loss of income and loss of enjoyment experienced by parties not engaged in the contractual agreement, solely due to a construction process. Social costs take many forms including loss of revenue, productivity and time, consumption of non-renewable resources and accelerated deterioration of secondary roads.

Social costs, while widely acknowledged, are rarely considered in the design, planning or bid evaluation phases of construction projects in North America. This is attributed to the difficulty associated with quantifying social costs using standard estimating methods and the fact that these costs are borne by the community rather than the contractual parties. This paper outlines 22 sources of social costs associated with construction projects in urban environments. The concept of 'social indicators' is introduced as a mean to link adverse impacts generated by construction activities and valuation methods. Thereafter, seven methodologies developed in the fields of economics and actuary are presented and their suitability for quantifying specific classes of social costs associated with construction projects are investigated. The capacity of current bid evaluation methods to account for social costs is also examined. It is concluded that a methodical approach for the incorporation of social costs in the bid evaluation process will be a key step towards a more sustainable-oriented construction industry. A generic framework for the development of such an approach is presented. Finally, the concept of developing a standard reference document to estimate social costs is examined and a sample format proposed.

Keywords: Construction; Social cost; Environmental impacts; Valuation techniques; Evaluation method

1. Introduction

Construction activities can have a significant impact on their surrounding environment. This is particularly true for urban societies. The term 'environment' in the context of this paper refers to the ecological, sociological and economical systems that surround construction activities or that are directly impacted by these activities. The term 'social costs' refers to costs incurred due to the execution of a construction project that cannot be classified as either direct or indirect costs incurred by the parties engaged in the contractual agreement (Allouche et al., 2000). Incurring a cost is defined as "the act of using resources for a specific purpose" (AWWA, 2000).

The term 'construction impact assessment' describes the process associated with the protection of the natural and built environments in the face of pending construction activities. This process contains three key steps, namely: (i) identification of relevant adverse impacts; (ii) evaluation of the costs associated with these impacts and (iii) a set of measures to mitigate these impacts. The first two steps are examined in detail in this paper.

Types of adverse impacts associated with construction activities are grouped under four headings: traffic, economic activities, air and water pollution, and damage to the physical environment. Potential impacts as a result

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of unregulated construction activities include traffic congestion and delays, disruption of economic activities, excessive generation of pollution and pollutants, damage to sensitive ecosystems, and damage to existing structures and infrastructure systems.

The valuation of social costs can be accomplished using different techniques, with the most appropriate choice depending on the nature of the impact under consideration. These techniques are grouped into two main categories, namely direct valuation techniques and indirect valuation techniques. Seven techniques that can be used for valuation of social costs developed in the fields of economic and actuary are presented, and their applicability for social costs valuation purposes is examined.

Several approaches have been proposed by various researchers for the incorporation of social costs into the bid evaluation process. An overview of bid evaluation techniques currently used in North America and parts of Western Europe is presented and their ability to account for social costs is examined. Two alternative bid evaluation methods, the cost/benefit effectiveness and the multi-rating evaluation system that adopts an objective base rather than a cost base approach to social costs, are also presented. The paper concludes with a discussion of the obstacles to the incorporation of social costs in bid evaluation practices and presents a generic framework for overcoming these difficulties.

2. The need for a new paradigm

Traditional contractual and bid evaluation practices do not account for economic losses resulting from construction-related activities that are borne by parties not engaged in the contractual arrangement. This can be attributed, at least partially, to the fact that owners and contractors normally do not have to justify their choice of construction methods and practices based on any valuation approach that considers the costs borne by the community. The contractor is obligated to fulfill the project's objectives in accordance with the contract documents, drawings and specifications. Within these limitations, his goals are to complete the project for the lowest cost, within the tightest time limits, and at the highest profit (Heiber, 1996). Thus, the contractor is unlikely to implement low impact practices unless they are required contractually or are economically favorable to him.

In recent years, there has been a growing awareness among the public as well as local government agencies of the significance of social costs and a growing pressure to minimize them. Proposals for large urban construction projects more often than not encounter organized and well-funded public resistance which influences the selection of alignments and construction methods (Sauer, 1998). The reasons for this transformation include: the ever growing traffic congestion in and around major urban centres; the increase in the volume of construction activities in urban areas due to the telecommunication revolution and large-scale programs for the renewal of linear water distribution and wastewater collection systems and highway rehabilitation and reconstruction programs; brownfield re-development programs (there are more than 400,000 brownfield sites across the USA alone; Augenbroe and Pearce, 1998); growing expectations that construction activities will not diminish one's quality of life and an increased awareness of alternative construction methods and technologies.

The authors suggest that mitigation of social costs can be accomplished effectively by incorporating them into the cost estimate and bid evaluation processes. Furthermore, it is argued that consideration of social costs during the bid evaluation process is an important component of the paradigm shift needed to move the construction industry toward a more sustainable oriented frame of mind. In contrast with the traditional view of time, cost and quality, the new paradigm shown in Fig. 1 uses broader terms and takes wider views of time (life cycle assessment), cost (construction and social costs; minimal resource consumption) and quality (human satisfaction; minimal environmental impact).

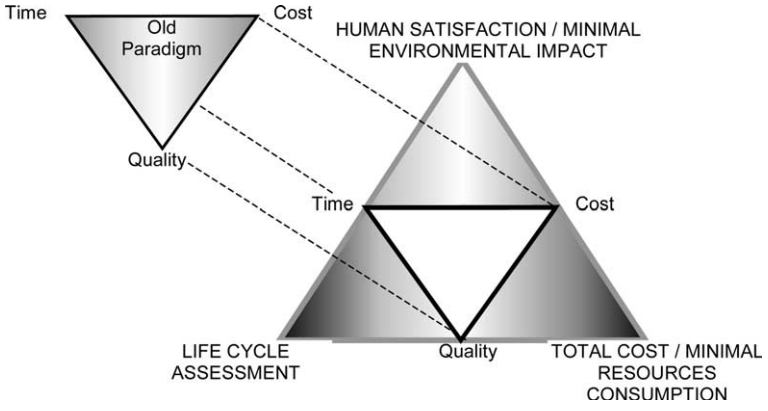

Fig. 1. The new paradigm for sustainable construction (modified after Vanegas et al., 1996).