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# REVIEW OF HIGHWAY CONSTRUCTION MANAGEMENT SYSTEM

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**ABSTRACT:** A highway system serves a set of objectives, for example, arrangement of an adequate level of service, preservation of the office condition, safety, economic development, and others. It comprises of a number of physical facilities, for example, pavements, bridges, roadside elements, and traffic signal devices. The system is managed through operational elements of a highway agency, for example, arranging, design, construction, maintenance, etc. The highway system would thus be able to be envisioned in terms of a three-dimensional lattice of objectives, facilities, and capacities, all of which interact with each other. The current trend of developing separate management systems for pavements, bridges, and maintenance activities is a piecemeal methodology, because it ignores the needs of the all out system. Consequently, many current systems are either clashing or involve duplication, or both. Instead, singular management subsystems, for example, pavement management, bridge management, and maintenance management, ought to be developed in proper coordination with each other and with a clear understanding of the requirements of the complete system.

## I. INTRODUCTION

Transportation planners and decision makers have for quite some time been concerned with how transportation investments and services shape economic development. In recent years, as projects become larger and more complex, and as public interest has become more typical, economic-development impacts (changes in the regional industry, commerce, agriculture, and income) have played a bigger role in project evaluation and prioritization. The significant role that economic development currently plays in transportation project evaluation and prioritization is due, in large part, to supporting legislation including the Transportation Equity Act for the twenty-first century, which contains an arrangement requiring consideration of economic development, and the earlier National Environmental Policy Act, which directs all federal agencies to make project decisions utilizing a systematic interdisciplinary methodology that balances engineering and transportation needs with social, economic.

A basic issue in street construction that affect project delivery, experienced practically worldwide, is cost overrun. It generally results from factors that happen during different stages of life-cycle of a project. Studies on highway projects have been conducted by quite a few researchers to seek the extent of this specific problem.

Discoveries by several creators indicate that it is associated with project design, project environment, and project size; project size, of course, is directly related to overall construction time. Construction procurement is the process of acquiring services and supplies for efficient and timely delivery of the end product. The significant project delivery methods include (1) Design Bid-Build, (2) Design-Build, and (3) Construction Management at Risk. Studies indicate that project performance is affected by project delivery method.

The trend in the use of project delivery system is evolving quickly. Project delivery system has evolved over the years. The medieval master builder was hired by an owner to design, engineer, and develop an entire office. This system was regular until the early twentieth century. With evolving technologies, it was necessary to change the type of delivery system that gave path to the Design-Bid-Build method. As the specialization of services increased, it was discovered that the interaction during design phase was extremely helpless which resulted in inefficient designs, increased errors and disputes, higher expenses, and ultimately longer schedule. This led to the Construction Management at Risk delivery system to improve the interaction among parties concerned and to overlap the design and the construction phases. Eventually, it was discovered necessary for owners to resort to a single source Design-Build contracting.

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## ELEMENTS OF A HIGHWAY MANAGEMENT SYSTEM

A comprehensive highway management system can be considered in terms of a three-dimensional matrix structure. The three dimensions are the highway office dimension, operational capacity dimension, and system objective dimension. Table 1 records the possible elements in each of the three dimensions.

The three-dimensional matrix structure indicates that a highway agency has a number of facilities in the highway system. The objectives of the agency are fundamentally related to savvy delivery of highway services. In this effort, the authoritative framework of the agency is divided into a gathering of, capacities. Each office in the system requires the entirety of the management capacities, and through arranging, design, construction and other capacities associated with the facilities in the system, the overall system objectives are fulfilled. In the event that one chooses to take a gander at a specific capacity (for example, arranging), it is necessary to establish proper coordination among all the facilities in the arranging process so as to contribute to the achievement of the objectives. Correspondingly, with regard to any of the objectives, an ideal highway management system will have it satisfied through all the capacities for any of the facilities.

**Table 1. Elements of Highway System Dimensions**

| Dimension | Highway Facility | Operational Function | System Objective |
|---|---|---|---|
| **Elements** | Pavement | Planning | Service |
| | Bridge | Design | Condition |
| | Roadside | Construction | Safety |
| | Traffic control devices | Condition evaluation | Cost |
| | | Maintenance | Socioeconomic factors |
| | | Improvement | Energy |
| | | Data Management | |

### Highway Facility Elements

A highway system has a number of physical facilities. Pavements, bridges, roadside elements, and traffic light devices are generally different in their service characteristics. Pavements and bridges are to convey traffic and traffic light devices are for traffic safety and guidance, whereas roadside elements are for convenience and esthetics. Pavements rarely bomb calamitously, however bridges may collapse with potential death toll. Then again, in spite of the fact that pavements and bridges deteriorate progressively with age, traffic light devices and some roadside elements might be put unavailable immediately by car crashes or mechanical issues. Activities performed on pavement and bridges unavoidably affect streams of traffic and cause delay to users. Activities related to roadside elements and some traffic signal devices may, however, be managed without a significant traffic disturbance.

The critical ramifications of the multi element structure of highway facilities is that each subsystem would compete for reserves and other resources, for example, manpower, equipment, and materials inside the same highway association. The overall effectiveness of a highway system depends on the levels of service provided by the individual subsystems. Because resources are limited, an ideal allocation among the different subsystems must be formulated. Because each office element has a different impact toward achieving different objectives of the all-out highway system, the relative importance of these office elements needs to be assessed for a sensible resource allocation.

In spite of the fact that there exist many management subsystems by office element types, and they may differ in technical details and emphases, one must recognize that the sequence of utilitarian activities in each and the objectives for every one of these subsystems remain the same.

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## II. LITERATURE REVIEW

Qamar et al pointed that so as to carry private investment into the street sector, the Ministry of Road Transport and Highways (MoRTH) means to grant over 85 percent of National highways and expressways projects on a Built Operate Transfer (BOT) cost premise. While this will result in a large number of tollgates on the Indian street network, the street user would prefer to travel seamlessly across expressways. An appropriate mix of technology and operational procedures is required to meet all the practical requirements of ringing and deliver a palatable user experience. The National Highway fee rules, 2008 prescribed the stretches on which user fee is collected, the topping rates per km for different types of vehicles, the mechanism to compute cost rates for BOT projects, concession to be given to neighborhood and frequent users, revision of rates, etc.

Ramnani et al In the investigation it is summarized that Tamil Nadu Road Development Corporation is JV Company between TNIDC and ILFS with the objective to capitalize privatesector cooperation and investment in the street sector and to initiate commercialization of Operations and Maintenance of Road assets.

Shubhara et al observes the cost collection the nation over is enhancing the record of the higher traffic volumes generated on some significant street hallways in the nation especially with high percentage of commercial vehicles.

Weiss et al has been found, for example, that singular highway projects generally don't essentially influence public or regional economies unless they are of extraordinary size. Additionally, projects that improve neighborhood access to employment sites have been discovered to be inherently different from those that improve connectivity between two cities.

Nadiri et al proposed the relative development of the transportation system has been discovered to be significant—with the presentation of new transportation infrastructure in a less-developed transportation system having a larger impact than the presentation of new transportation infrastructure in a mature system.

McQuaid et al explained the amount and quality of transportation infrastructure may further draw in new businesses and induce existing businesses in an area to remain or to expand. The potential for such effects additionally depends upon the type of project being proposed. Highway lane options, extra interchanges and construction of completely new highways generally have been appeared to have a greater potential for indirect effects than projects zeroing in on simple improvements to existing streets. All things considered, it is generally recognized that the economic impact of a specific project is still best evaluated on a case-by-case premise.

Eberts et al review the economic-development impacts of alternative highway investments. For example, productivity studies, especially those utilizing production and cost work frameworks, normally use aggregate recorded data and don't take into account the intensity of use of transportation systems nor do they encompass system-wide effects. Treating all transportation systems as though system–wide effects, (for example, traffic streams) are the same might lead to biases in the estimates of the productivity of the transportation infrastructure. The estimation of economic-development impacts utilizing an info yield approach can likewise be restricting because it does not represent long haul economic, modern, and demographic changes or for changes in business costs over time. As a result, input–yield examination is unlikely to be useful as an independent methodology at the project level to recognize among the economic-development impacts of different types of highway improvements.

Jetli et al discusses the maintenance and management of highways through different safety measures and amenities. The investigation emphasizes that office to be provided for traffic, including giving relief to the accident casualties and ensuring removal of bottlenecks in rush hour gridlock movement, ought to likewise feature in the highway management. The creators have outlined the definition of hall management as the technique of dealing with the highways to deliver maximum throughput in terms of speed and traffic volume, while limiting operational expense and enhancing street safety. O and M contracts are given to achieve these objectives. The broad scope of O and M is street maintenance, street property management, incident management, traffic management and engineering improvements. The examination highlighted the different safety measures being adopted as a piece of passage management. They are: (I) Usage of street safety furniture, for example, crash barriers, street signage, delineators, street studs, median railing, thermoplastic street checking, and ranch of bushes in central median to reduce glare of light of vehicles from the opposite direction, (ii) Deployment of nonstop route watch vehicles, ambulance for immediate rescue of accident casualties and

tow-away cranes for quick clearance of the highway, and (iii) Development of wayside amenities to reduce the fatigue of significant distance driving. Street user services are the advantages or privileges collecting to the vehicle driver or owner through features of safety, solace, and convenience, etc.

Quamar et al noted broadly different features of the Model Concession Agreement (MCA), a milestone strategy initiated by the Govt. of India about a decade back, for the use of NHAI for preparing guidelines for granting and operating the street projects in India. The approach has a significant feature of Road User Services (RUS) and user fulfillment. In the vehicle industry, the quality of efficient service ought to be summarized as the service comprising of speed, safety, frequency, regularity, comfort and acceptable expense. These markers of quality of service rendered by the vehicle system can be measured by the insights developed by user conclusion scores on the service quality pointers.

Duy Nguyen et al establishing, a detailed definition rating for capital projects, has been prepared. He proposed the use of the definition checklist for applying contingency to capital quotes and afterward validated the checklist by contrasting the definition evaluations of 30 projects to their respective levels of cost overrun. The U.S. department of energy recognized the importance of accurate conceptual quotes and contracted with the Rand Corporation to contemplate the capital cost estimation problems associated with pioneer energy and furthermore process plants. The investigation determined that 74% of cost development is caused by underestimation, that is, improper estimation. In 1991, the Construction Industry Institute (CII) assembled a research team to contemplate the impact of pre-project anticipating overall project success for capital projects. The team tried to evaluate the impact by establishing a success index value to rate project success. The success index value was computed and compared to a pre-project arranging index value for a variety of projects.

Hegazy et al used a neural network (NN) way to deal with effectively manage construction cost data and developed a parametric expense estimating model for highway projects. Eighteen highway projects in Newfoundland, Canada were the source of the cost data and they used weightings that produced the best cost prediction for the chronicled case studies to locate the ideal neural model.

Hollar et al reported on quantitative data they collected and analyzed from completed construction projects in the process industry. The resulting model, known as the estimate score procedure, allowed a project team to score an estimate and afterward predict its exactness based on the estimate score. They identified five primary elements affecting estimate exactness and, arranged by significance, were: fundamental design, team experience and cost data, time allowed to prepare the estimate, site requirements, and offering and work climate.

Williams et al reported their survey that found that around 33% of architectural/engineering (An/E) projects miss cost and schedule targets. Chang noted that, as reported by, there have been few instances where an engineering design was finished to the point that a project could be worked to the exact specifications contained in the first design documents. Many construction problems are due to design defects and can be traced back to the design process.

Kumaraswamy et al reported that on four completed case study projects for environmental and engineering design services for street construction projects in California that were carried out on an expense in addition to fixed-fee premise, they experienced cost increases on average of 24.8%, based on the four sampled projects. The estimation is affected by different cost related components beginning from the project arranging and programming (inception), design, offering, reasonable realization and controlled execution, post evaluation and handover of highway projects. Despite the fact that a number of works have been reported for this purpose. However, because of involvement of many danger factors, it is as yet challenging. A review of the literature has established that horrible showing of projects in terms of cost overrun is normal place in the construction industry. A proper cost estimation procedure is required to satisfy every one of these requirements. The project quote is basically concerned with the expense of resources needed to complete the project activities and include all the processes which are employed to keep up monetary command over a project. Classically the project cost estimation was done by establishing a model in mathematical structure utilizing cost governing elements. The problem with classical regression investigation is their requirement of mathematical definition which comes up short because of number of variables present.

## III. CONCLUSION

Construction Management to understand the objectives of factual modeling, including accurate predictions Construction management, taking courses in Advanced Project Management, Construction Economics, and Construction Information. It will likewise be useful for all parties associated with the construction industry to

predict the mean time required for the delivery of a street project. It provides an alternative and logical method for estimating construction time, both by bidders and clients, to supplement the prevailing practice of estimation predominantly on singular experience.

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