



TECHSUMMARY *April 2022*

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Determining the True Cost and Benefit for Collecting and Maintaining Non-Road and Non-Bridge Asset Data

INTRODUCTION

State departments of transportation have, in the recent past, prepared Transportation asset management plans as directed by the Federal Highway Administration (FHWA), covering the National Highway System and the bridges on that system. The use of asset management plans for the highway system was first promulgated by MAP-21, which changed the emphasis from “Worst first” to “Preservation first” as the underlying rationale for allocating scarce resources to the nation’s transportation systems. As stated in 23 CFR Part 515.5, “Asset management means a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the life cycle of the assets at minimum practicable cost.” Recent discussions in the transportation profession have recommended extending the principle of asset management planning to most or all the assets that are used to provide transportation. Asset management plans require data to support them. These data include a systematic inventory of the assets themselves, their current condition, risks associated with the future of these assets, and the level of use made of the assets. Such data collection and analysis incurs significant costs and may require a dedicated staff to maintain the data and use the analysis.

OBJECTIVE

The principal objective of this research was to provide a consistent methodology to assess and compare the costs of establishing a database on any asset of DOTD, the costs of maintaining the database, and the benefits of creating such a database. The methodology should be able to be applied to any asset that DOTD may wish to consider in the future and should provide a way to ensure that decisions on whether to collect data on an asset are made in a manner that is consistent across all assets. The goal is to ensure that such future decisions are made in the same way, irrespective of who is making the decisions and that it can be clear as to the basis for the decision in every case.

SCOPE

The research should identify the primary aspects of an asset that contribute to the costs of collecting and maintaining data on it and the primary aspects of the benefits of collecting the data on an asset. It is intended that the methodology be applied initially to four assets, namely culverts, guard rails, impact attenuators, and pavement striping although the methodology should be applicable to any asset of the DOTD. These four assets are to be used to illustrate and to test the methodology.

METHODOLOGY

Nothing in the literature review showed any methodology of the type requested for this research. As a starting point, it was decided to develop three modules—cost of establishing a database on the asset in question, cost of maintaining the database, and benefits of collecting data on the asset. It was required that these modules be defined in such a way that they could be applied to any asset of concern to DOTD. To proceed on this, the research team developed for each module a description of the factors that it was thought would impact the costs in the case of the first two modules and the benefits in the case of the third module. These were used to guide the next step in the process.

The second step in the process was to develop questions that would need to be answered to quantify the levels of cost or benefit within each module. An individual at a sufficiently high level of knowledge and authority for a specific asset would be asked to respond to certain questions about the asset that would allow determination of the order of magnitude of the costs and benefits. It was assumed that, for this methodology, actual determination of the specific dollar costs of each aspect of data collection and of the benefits from collecting data would not be determined. Rather, the goal was to assess the comparative costs and benefits on a five-point scale ranging from “Very Low” to “Very High.”

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The questions would also include information about any existing database within DOTD that related to the asset in question, to determine how extensive a new data collection effort would need to be. In addition, because some assets may already have routine data collection undertaken, the extent of such routine data collection needs to be established because it would reduce the cost of maintaining the database. Finally, a group of questions needed to be answered to ascertain the benefits of collecting data. These questions were mainly focused around the disbenefits arising from unforeseen failures of the asset, which it is assumed would be less likely to occur if a database was being maintained about the asset. It was assumed that the database would include data on the condition of each installation of the asset, so that collecting the data on the asset should reduce the likelihood of unforeseen failures.

The methodology that was conceived to implement this was to embed the questions in an Excel workbook in which the responses to the various questions could be used to generate a score for a particular asset. This score would be used to classify the responses for initial data collection, maintaining the database and estimating the benefits into the three or five categories ranging from "Low" or "Very Low" to "High" or "Very High."

The final steps in the methodology were to use the scores and produce a summary of the information and compute the levels of costs and benefits in a concise manner to guide the decisions of DOTD officials. It was also felt to be desirable that there should be some flexibility in determining the boundaries between each level of cost or benefit with the requirement that the distribution of costs and benefits against the five levels of cost and benefit describe a more-or-less bell-shaped distribution, i.e., that medium should have the most occurrences among the scenarios and, on a five-point scale, the extremes of "Very Low" and "Very High" should be associated with the fewest scenarios.

CONCLUSIONS

A spreadsheet method was created that provides a means to assess the costs and benefits of creating a database for any asset of DOTD. The method has some flexibility that can allow for the effects of uncertainty to be evaluated on the outcome of the assessment of costs and benefits.

It is important to note that many classes of assets are quite heterogeneous and may make it somewhat difficult to respond to some of the questions. To keep the methodology simple, it has been necessary to treat each asset as being relatively homogeneous. The heterogeneity of some assets could be handled by completing the workbook for sub-classes of the asset. For example, retaining walls could be classified into those on interstate highways and other major roadways (such as federal roads and the more major state roads), while a third category would be retaining walls on the remaining minor state roads.

A problem may also arise in completing the workbook for any asset that is not under the jurisdiction of a particular division of DOTD. In such cases, it would be necessary to identify one or more individuals within DOTD that may have sufficient knowledge of the asset to be able to complete the workbook.

Apart from these issues, the workbook should work well for any asset owned or managed by DOTD.

RECOMMENDATIONS

It is recommended that the workbook be implemented for assets that are not currently included in DOTD's Asset Management Planning procedures. A committee of upper-level management within DOTD should then review the results and decide whether the database should be established, based on the assessed costs of database establishment and maintenance and the benefits to be gained from the database. It is also recommended that some assets, for which a database is already in existence and is being maintained, be assessed to determine whether the decision to collect data on those assets would be warranted by this methodology. The results of this process may possibly suggest some modifications that could be made to the procedure.