

# Evaluation of the WYDOT Research Center and Research Program (Phase III)

## **WYDOT Sponsors:**

Mr. Tim McDowell, P.E.  
State Programming Engineer  
Wyoming Department of Transportation  
(307) 777-4490  
[Tim.McDowell@dot.state.wy.us](mailto:Tim.McDowell@dot.state.wy.us)

## **Principal Investigator:**

Khaled Ksaibati, Ph.D., P.E.  
Director, Wyoming Technology Transfer Center  
University of Wyoming, Laramie, Wyoming, 82071  
307-766-6230; [khaled@uwyo.edu](mailto:khaled@uwyo.edu)

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Wyoming Department of Transportation  
Programming Research Unit  
5300 Bishop Blvd.  
Cheyenne, WY 82009

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## **1. Introduction:**

Evaluating research programs of federal, state, and local transportation agencies is thought to be a necessity to attain the most efficient and relevant results from the program. Evaluations of research programs ensure that transportation agencies get the highest return on their investments. A valuable research program in a transportation agency provides improvements in highway safety and enhances the progress of the overall organization by improving infrastructure, infrastructure management, and cost avoidances for a variety of systems. When a research program is operating efficiently, not only does the sponsoring agency benefit, but so does the transportation community as a whole.

Some of the top cost savings measures found in transportation research are public health and safety; economic vitality and fiscal responsibility; transportation system efficiency; and environmental quality. In 2016, the Wyoming DOT Research Center is interested in identifying the types of cost benefits that should go into the decision making process when selecting research projects; what project evaluation measures should be used; and what the relevant methods for analysis and presentation should be. The Research Center is also interested in ways to translate the effects of the investment in the research project into monetary terms and ways to account for the fact that the benefit accrue over a long period of time while capital costs are incurred primarily in the implementation stage.

## **2. Background:**

This background section will cover two previous studies involving a developed methodology implemented for the Wyoming Department of Transportation's Research Program to demonstrate how the methodology can be utilized. Both studies concluded that the WYDOT Research Program was an effective and valuable asset for WYDOT and the transportation community. The studies identified a comprehensive process to continue the monitoring of the Research Center based on selected performance measures.

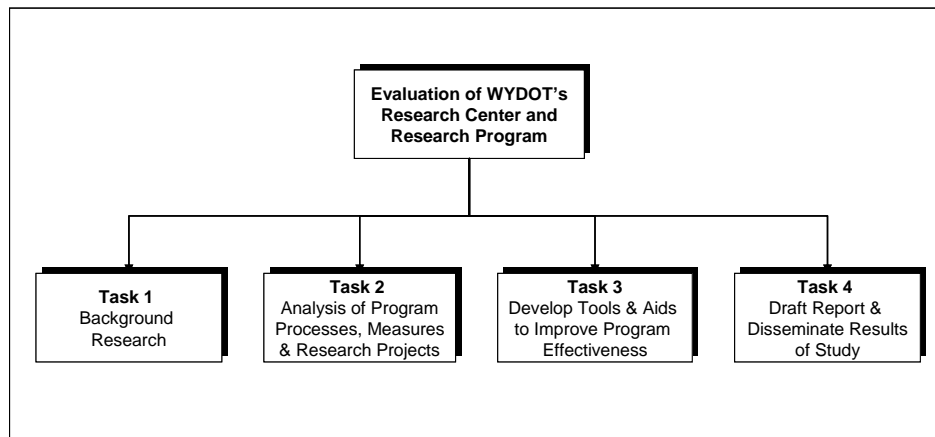
### **Evaluation of the WYDOT Research Center and Research Program (Phase I)**

The Wyoming Department of Transportation's Research Center receives approximately one million dollars in annual funding. A research program within an engineering organization, such as WYDOT, can be a valuable tool in contributing to meeting corporate goals. In transportation, effective investment in research creates knowledge and innovations that result in more cost effective management of assets, improvements in safety and mobility, cost savings and other public benefits. Given the leverage of research dollars, improvements in research effectiveness yield high return on investment. With this understanding, WYDOT's Research Center management contracted R&S Consulting/UW in 2007 to analyze the Research Program and provide strategic and operational recommendations and implementation assistance to increase program effectiveness. The study resulted in a final report titled "A Methodology for Evaluating DOT Research Programs, A Case Study: Wyoming DOT".

The primary project objectives were to:

- 1) Enhance the Program by formulating more refined research management strategies, evaluation methods and performance measures.
- 2) Develop an approach for identifying potential research needs as well as long and short term goals for research.
- 3) Create a framework for continuous Program improvement and build upon the Program's foundation to develop a sustainable structure that will maintain Program success and continuity independent of future changes in WYDOT staff.

The project was divided into the four tasks shown in Figure 1. Task 2 and 3 were highly interdependent.



**Figure 1. Project Work Breakdown Structure**

This project developed a methodology that identified ten performance measurements that were used to determine the direction, effectiveness, and accomplishments of the Wyoming Department of Transportation (WYDOT) Research Program. These performance measures were derived using a 2001 NCHRP study, Performance Measures for Research and Technology Programs (Sabol, 2001). From that study and surveys taken from DOT's across the country, the ten performance measurements were selected. These measurements were created to link WYDOT's strategic goals to their research program. The goals of the performance measurements are to improve the management of the research program by linking program funding, program strategy, and project selection to support WYDOT's strategic plan. Using the linkage of the performance measurements to the strategic plan, the following three categories of performance measurements were formed:

- Strategic Portfolio Measures – These performance measurements link WYDOT’s policies to the direction of the research program, including a balance of projects supporting different goals, and a distribution of funded projects from pooled fund studies to contracted research to in-house research.
- Project Output Measures – These performance measurements focus on the results and outcomes of the research projects and the benefits or implementations that resulted from the projects.
- Program Efficiency and Management – These performance measurements look at the cost-benefits of the program, as well as administrative and overhead costs compared to the program’s overall budget.

From the three categories of performance measurements described above, a total of ten performance measurements were developed for summarizing the findings of a research program evaluation, as described by the methodology. The ten performance measures were formed with the following guidelines:

- Use as few measurements as possible.
- Focus on the outputs and results.
- Non-research personnel should understand the measurements; some measurements are for internal purposes only.
- Each measurement should be quantifiable, meaning that comparisons could be made after multiple evaluations were completed.

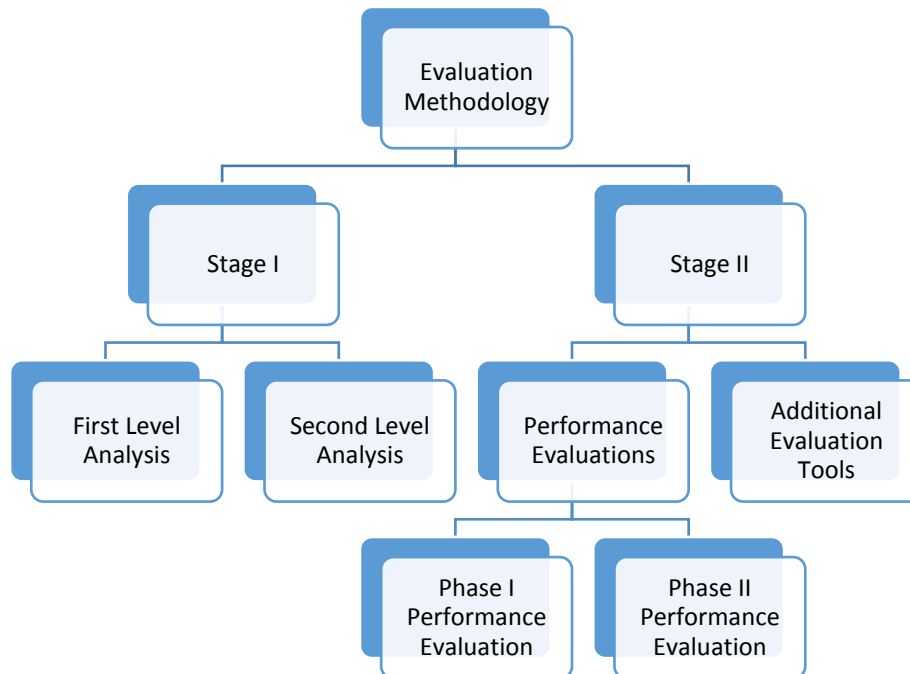
### **Evaluation of the WYDOT Research Center and Research Program (Phase II)**

In this phase, a methodology for conducting an evaluation of a research program within a transportation agency has been developed. The developed methodology is an evaluation process that encompasses a multilevel analysis that focuses on the outcomes that research projects and the research program has generated. The methodology provides ten performance measurements that are used to summarize the findings of the evaluation. These performance measurements are quantifiable, meaning they are designed to place a score or value on the accomplishments of the research program which can then be used to make managerial decisions for the research program.

The developed methodology was implemented on selected projects for the Wyoming Department of Transportation’s Research Program to demonstrate how the methodology can be utilized. It was found that the WYDOT Research Program was an effective and valuable asset for WYDOT and the transportation community. Specific recommendations and conclusions for the WYDOT Research Program were presented. Final recommendations for implementing the methodology

for any other agency looking to perform an evaluation of their research program were also presented.

The evaluation methodology presented, is a two stage process that can be used to evaluate the performance and effectiveness of DOT research programs. Figure 2 shows how the evaluation methodology is organized by the two stages.



**Figure 2 Breakdown of the Evaluation Methodology**

The stage I methodology includes the first and second level analyses. The first and second level analyses gather the necessary information from the DOT research program to address the performance measures which were developed by “A Methodology for Evaluating DOT’s Research Programs, A Case Study: Wyoming DOT.” The first stage analysis addresses eight of the ten performance measurements. The eight performance measurements that are addressed in the stage I methodology include the following:

- Number of projects and amount of funding per project by strategic intent.
- Number of proposals responding to the research program solicitations.
- Number of needs statements submitted by the agency’s programs.
- Outcomes of a project: specifications revised, new methodologies implemented, dollars saved/costs avoided, facilities with extended life, crashes reduced, fatalities reduced, new products evaluated and implemented, policy/legislative impacts, etc.
- Number of research reports completed each year and number of research reports not completed within three years.
- Percentage of administrative costs to overall program funding.

- Funds requested by research community versus funds available.
- Percentage of projects completed on-time and within budget. (Walton et. al., 1999)

These performance measurements address the direction that the research program has been moving towards during the time period analyzed as well as administrative measurements.

The stage II methodology includes the performance evaluations and other additional evaluations that DOTs may want to include for the review of their research programs. The stage II methodology was developed in this study to focus on quantifying the impacts of individual projects as well as the research program as a whole.

Performance evaluations were created to quantify all research projects that DOT research programs complete. The performance evaluations consist of a two phase analysis that looks at projects immediately and two years after completion. These evaluations can be initiated by the DOT research program, as shown in the methodology, and they will quantify the effectiveness of the completed research projects. After a research project has been through the multi-phase analysis and received a score, the DOT research program managers can make recommendations for future research needs and project selection. The proposed two stage methodology will insure that research programs are fulfilling the emerging needs of DOTs.

### **3. Objectives**

There are two main objectives of this study in order to continue to identify economic sustainability of the WYDOT Research Center. The two objectives are as follows:

1. To evaluate performance of the WYDOT Research Center based on the research studies that were conducted after Phase II of this study in 2010. Since 2010, the performance measures recommended in Phase two have been implemented. This objective will evaluate the effectiveness of the current performance measures.
2. To develop strategies that will implement real cost-to-benefit analyses on the performance measures currently used by the WYDOT Research Center.

### **4. Research Tasks**

The following research tasks will be performed in this study to address Objective 1:

1. Conduct a comprehensive literature review about any research or evaluations performed by other Departments of Transportation and their Research Centers.
2. Work closely with the WYDOT Research Center to identify all past projects initiated or completed since 2010.
3. Build a representative sample of all projects imitated or completed since 2010 to be included in the evaluations.

4. Secure performance measure information from the WYDOT Research Center on all the selected projects.
5. Secure cost data from WYDOT with regards to the management of the program; secure cost data for each project initiated or completed; and secure budgets and completion dates of each project.
6. To identify implementations, survey questions will be developed. The surveys will be conducted with WYDOT personnel to identify the level of implementation for every research project included in the study.
7. The benefit associated with implementing every individual research project will be quantified.
8. Determine the effectiveness of the overall WYDOT Research Program based on all past information described in these tasks that is collected.

The following research tasks will be performed in this study to address Objective 2:

1. Conduct a comprehensive literature review on all cost-to-benefit analyses or evaluations that have been performed by other Departments of Transportation or researchers nationally and internationally.
2. Identify suitable cost-to-benefit analyses for implementation by the WYDOT Research Center.
3. Develop toolkits or templates for WYDOT to use as a part of the implementations of the developed cost-to-benefit analysis.
4. Develop recommendations for future benefit-to-cost analysis research for certain procedures that are not available from researched information in the literature review.
5. Prepare a final report to combine all findings and recommendations of this study.
6. In order to fully implement this project, the findings of the study will be presented to the WYDOT staff.

## **5. Study Outcomes**

This study will provide specific conclusions, recommendations, and products at the following four levels to improve the economic sustainability of the WYDOT Research Center:

1. A final report with all the findings of the case studies will be provided.
2. Conclusions on past performance of current research projects will be provided.
3. Recommendations for strategies to implement a cost-to-benefit analyses will be provided.

4. The conclusions and recommendations will be presented to WYDOT to fully implement this project.

### 6. Timeline and Staffing

This study will be performed by Dr. Ksaibati who will be assisted by a graduate student. The study will begin October 1, 2016 and concludes March 31, 2018.

### 7. Budget

The budget breakdown for this project is shown in Table 1.

**Table 1. Research Budget Breakdown.**

<b>Evaluation of the WYDOT Research Center (Phase III)</b>		
<b>October 1, 2016 – March 31, 2018</b>		
<b>Budget Categories</b>	<b>WYDOT Contribution</b>	
Faculty Salaries	\$	6,000.00
Supporting Staff	\$	2,000.00
Fringe Benefits	\$	4,240.00
Graduate Student	\$	20,500.00
<b>Total Salaries</b>	<b>\$</b>	<b>32,740.00</b>
Travel	\$	2,200.00
Supplies	\$	2,000.00
<b>Total Direct costs</b>	<b>\$</b>	<b>36,940.00</b>
<b>Indirect Costs</b>	<b>\$</b>	<b>7,388.00</b>
<b>Total Costs</b>	<b>\$</b>	<b>44,328.00</b>

### 8. References

Redd, L., Schneider, G., & Ksaibati, K. (2008). *Evaluation of WYDOT's Research Center and Research Program*. Cheyenne: R&S Consulting, LLC.

Terfehr, J., & Ksaibati, K. (2012). *Evaluating Department of Transportation's Research Programs: A Methodology and Case Study*. Laramie: University of Wyoming.