



R&S  
Consulting

# Evaluation of WYDOT's Research Center and Research Program



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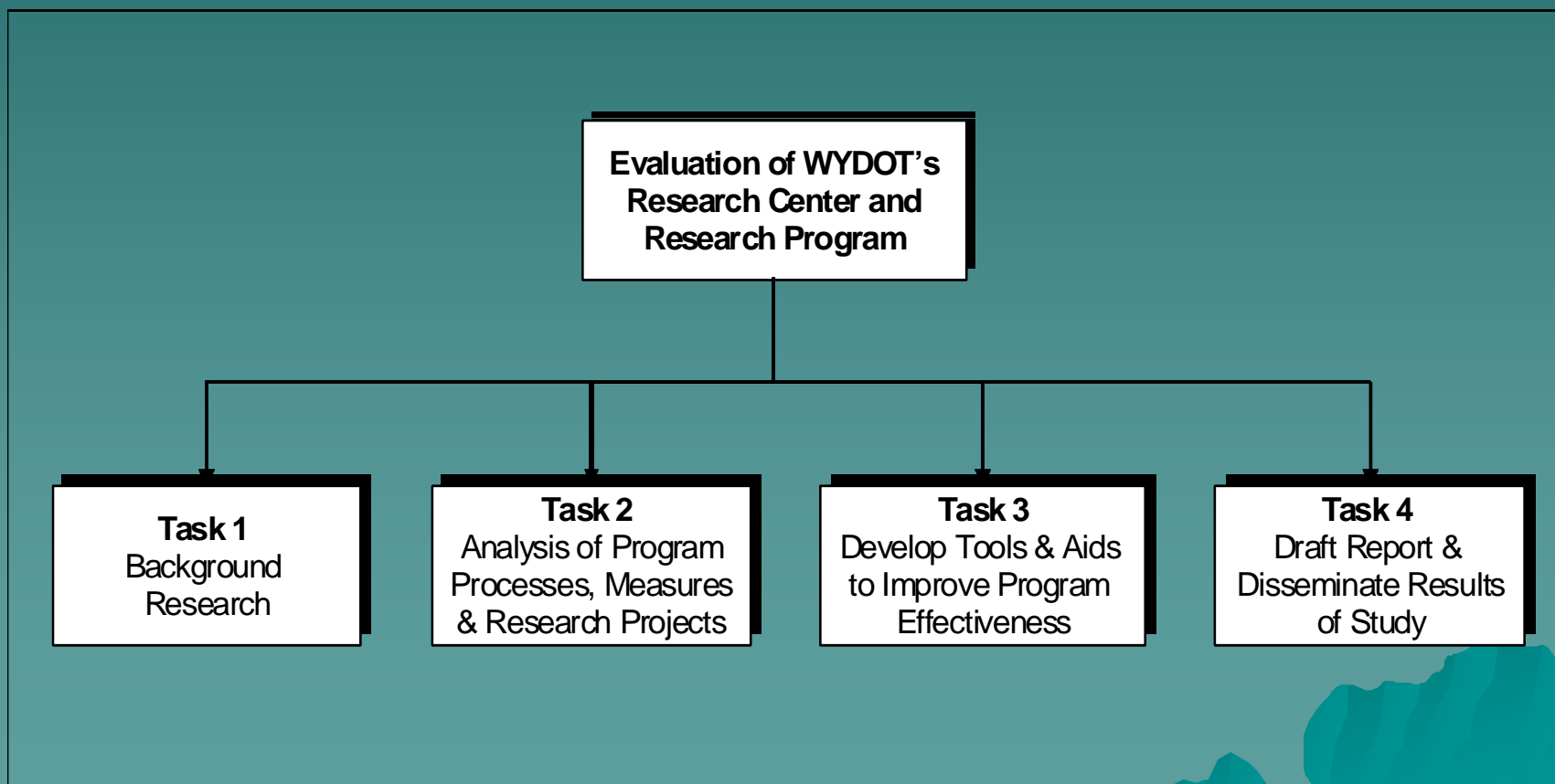
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# Project Info & WBS

- ◆ Start Date Jan 17<sup>th</sup> 2007
- ◆ Completion Date March 31<sup>st</sup> 2008
- ◆ Contract Amt = \$52K





# Study Objectives

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- Enhance the Program by formulating more refined research management strategies, evaluation methods and performance measures
- Develop an approach for identifying potential research needs as well as long and short term goals for research
- 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 staff changes at WYDOT



# Executive Summary

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Overall the Research program is very efficiently managed:

- Proposing projects to the RAC
- Executing projects with sponsors
- Fulfilling administrative requirements
- **Minimal decision layers**
- Responds quickly
- Not afraid to support research that falls “outside the box”

*There are very few public sector research venues in the U.S. (in any technical field) as streamlined and responsive as WYDOT’s Research program.*

That said,

***There are significant opportunities to improve program effectiveness...***



# Executive Summary

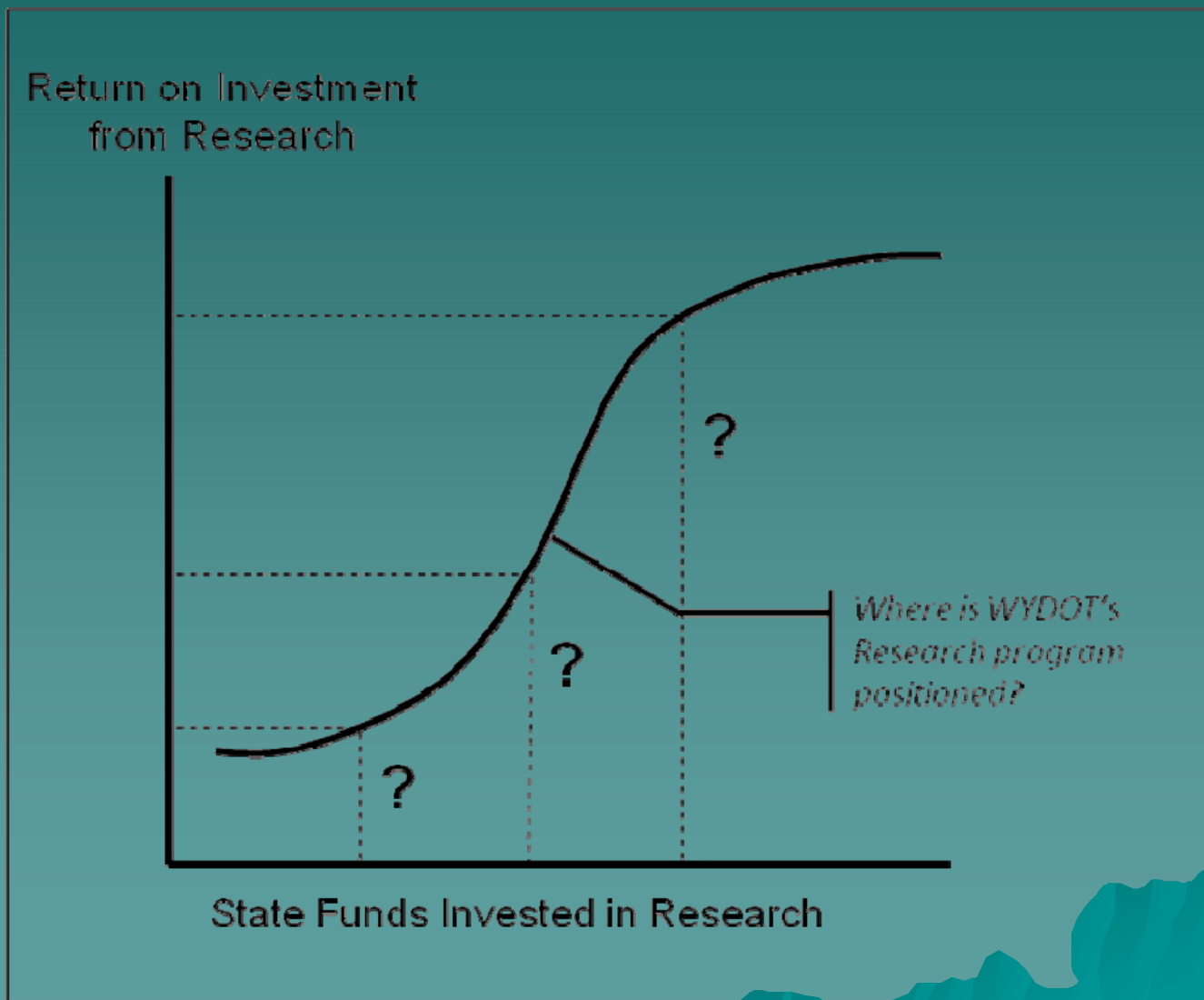
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This study:

- Presents an analytical process to more directly link research to WYDOT's strategic goals and balanced scorecard measures
- Defines performance measures for improving program effectiveness -- a proposed "balanced scorecard" for the Research program
- Provides a proposal evaluation checklist for the RAC
- Provides a survey for gathering feedback from researchers and sponsors
- Identifies conditions when/how/why pooled funds projects provide a high return on investment

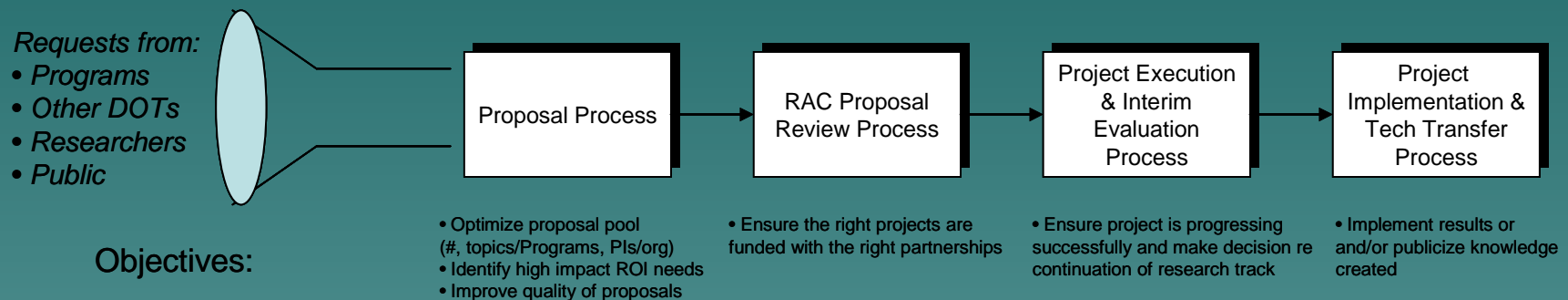


# Return on Investment from R&D



# Program Review

The overall program execution process was structured into four sub-processes and was then critiqued



Projects were given two levels of analysis (breadth & depth):

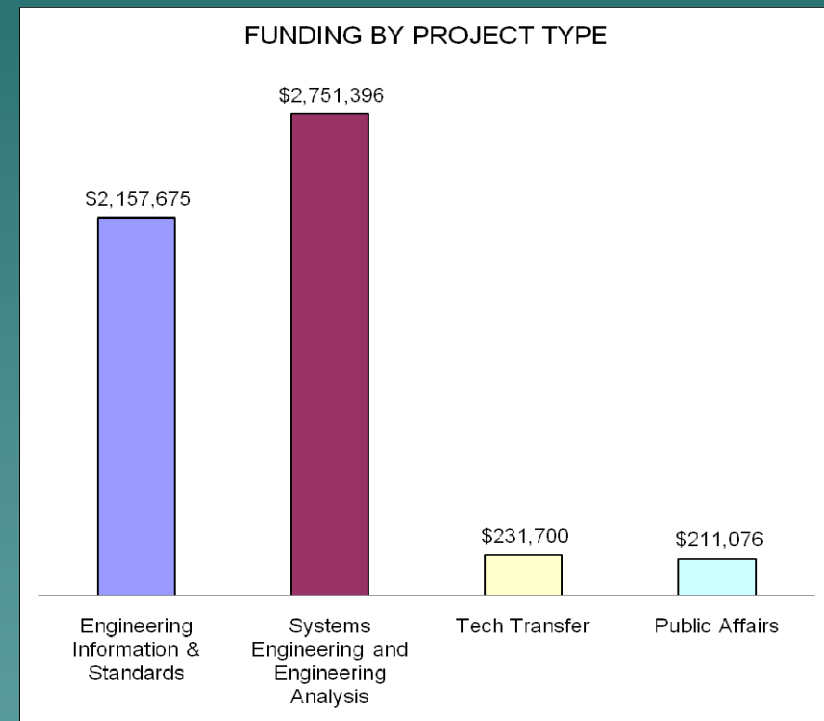
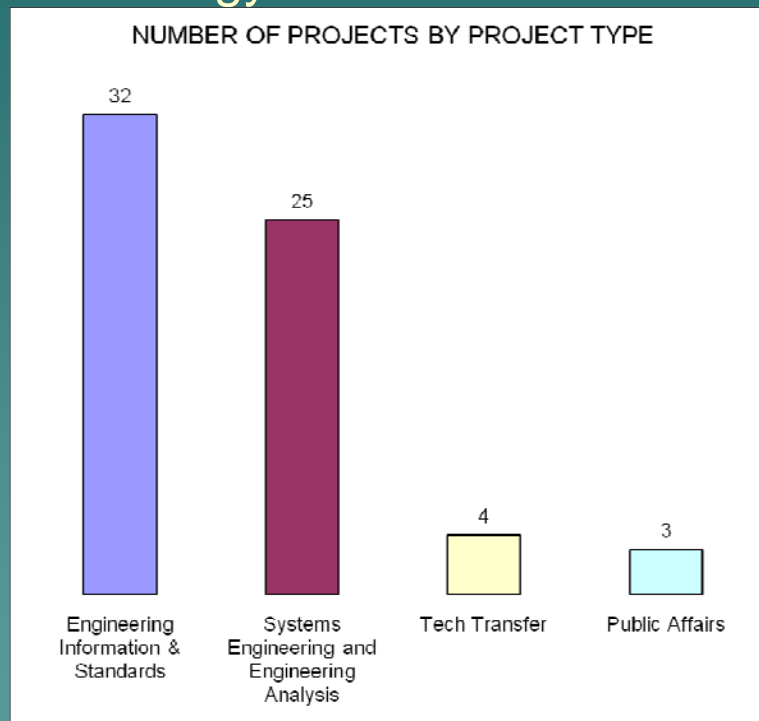
- The broad analysis looked across 64 projects funded between 1999 and 2007.

- In-depth analysis consisted of case studies on 23 selected projects; providing a representative cross-section of programs and entities performing the research and various combinations of project attributes.



# Review of Research Projects

**Project Type** describes the project's position along the science and technology continuum

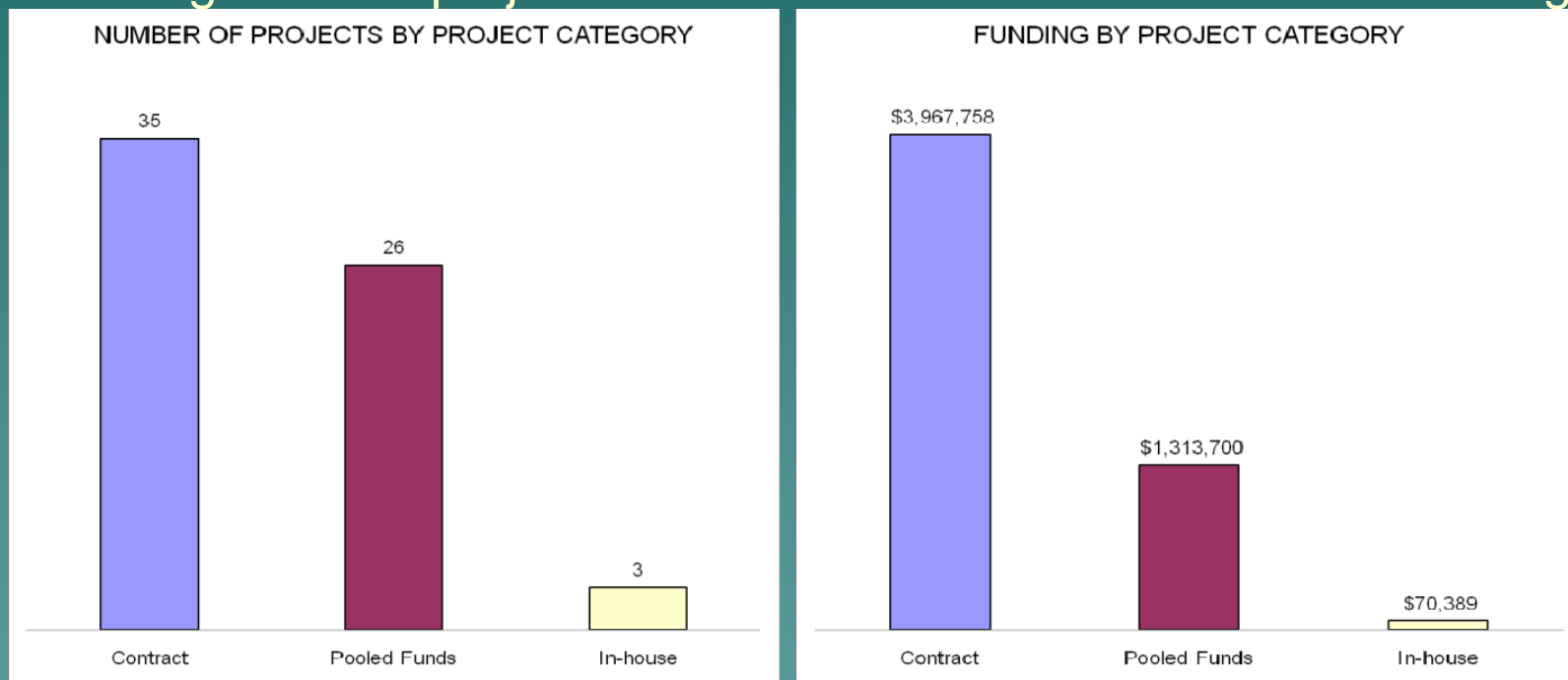


- Good balance in funding between support of basic science and engineering principles vs. applied engineering solutions
- Indeterminate if this is an optimal mix



# Review of Research Projects

**Project Category** describes the means to execute the project including how the project was funded and who received the funding



- Approximately 75% of funding spent on contract research is a good allocation across the research portfolio
- Contract research (based on case studies) has provided WYDOT a relatively high ROI



# Review of Research Projects

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When pooled funds projects adequately meet a common need across states and can be rationalized by filling a gap in a research track they can be a sound investment for WYDOT

As shown in the case studies, WYDOT's ROI from pooled funds projects can vary greatly depending on several factors:

- Dependence on location for relevance to WYDOT
- Number of participating states (double-edged sword)
- Capabilities of the lead state to manage the project
- Level of involvement and commitment of the WYDOT program and the WYDOT representative on the Technical Advisory Committee



# Review of Research Projects

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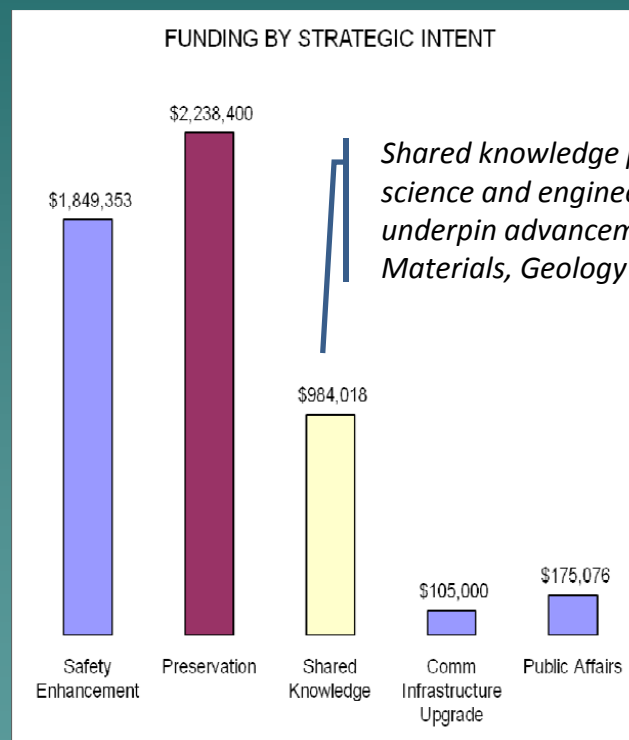
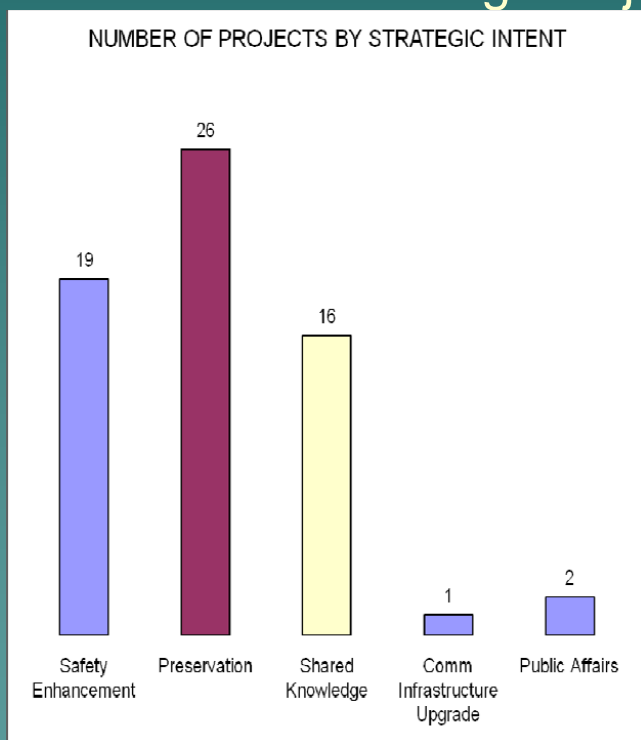
Pooled funds projects provide high ROI when focused in the following areas:

- Developing and modifying standards
- Developing instruments and tools
- Establishing unified policy positions
- Creating a somewhat unified industry for interaction with the private sector
- Addressing corridor issues that cross multiple state boundaries
- Working on projects in areas of basic science and engineering principals, i.e. the left side of the science and technology continuum.

***When pooled funds projects adequately meet a common need across states and fill a gap in a research track they can be a sound investment for WYDOT***

# Review of Research Projects

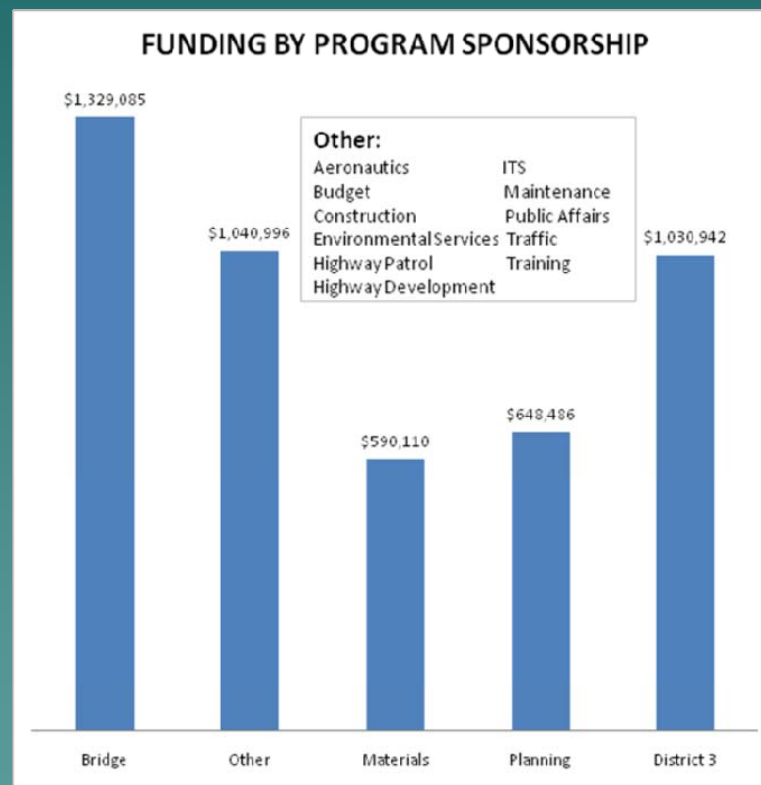
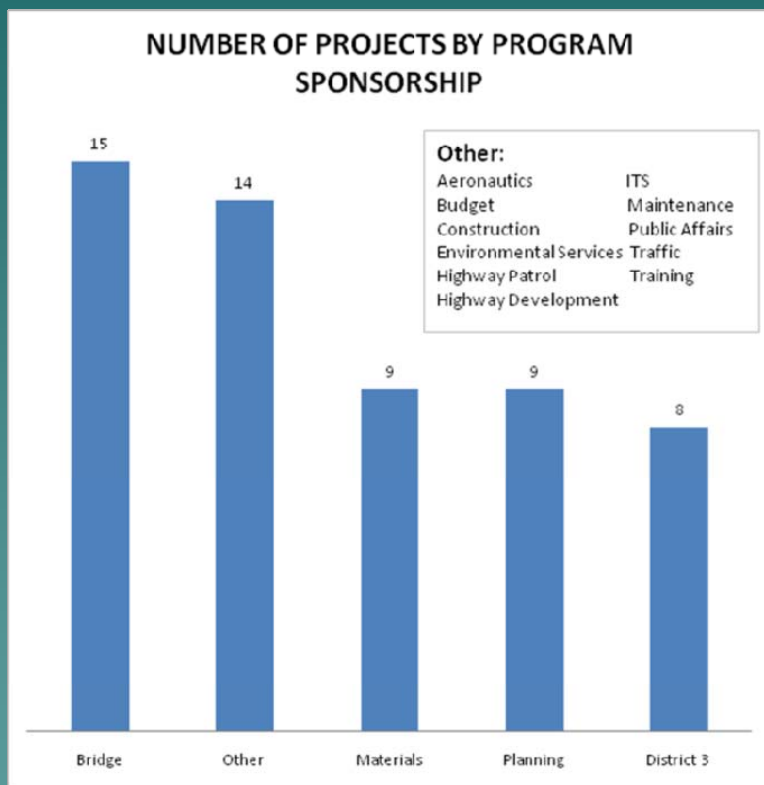
**Strategic Intent** describes the linkage between a research project and WYDOT's strategic objectives



- Safety enhancements and preservation projects accounted for 70% of funding over the past eight years (95% when including shared knowledge projects)
- Program has avoided pressure to fund projects only marginally related to WYDOT's strategic goals

# Review of Research Projects

Seventeen programs have sponsored 64 projects over the past eight years



- Bridge is far and away the most active program sponsoring research
- District 3 has also been highly involved in research
- Only one project sponsored by Highway Development



# Linking Research and BSC

- Two approaches, “strategic” versus “opportunistic”, were presented to WYDOT’s research program management and Executive Staff as to whether the program should have a more strategic focus
- It was decided that the Research program would partly transition to a more strategic focus
- But it was important that the program retain a significant share of its funds to support informally solicited research opportunities
- In order to implement this decision the Research program must develop and manage a structured research agenda



# Linking Research and BSC

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Four tasks needed for developing and managing a research agenda (*“Model, Measure, Manage”*):

1. Working with programs to translate measurable BSC goals into coherent research plans comprised of research tracks which flow down to prioritized projects
2. Targeting the research community with solicitations for proposals which address these priorities
3. Ensuring programs' research tracks are progressing
4. Assessing the impact of research outcomes on achieving the BSC targets on a continual basis and periodically re-evaluating the research tracks and priorities with the programs

# Linking Research and BSC

Four BSC goals directly supported by the Research program:

Goal	Strategy	Measure	Target	Actual
<b>Keep people safe on the State transportation system.</b>	Through education, engineering, enforcement and other innovative methods to continuously improve the safety of the transportation system.	# Fatalities Fatality Rate per 100 million VMT Crashes per million VMT Seat belt usage	TBD TBD TBD	195 2.10 2.66
<b>Serve our customers.</b>	Gather feedback from our customers to anticipate and meet their needs.	See, <i>Excellence in Transportation</i> (WYDOT, July 2007)		
<b>Take care of all physical aspects of the State transportation system.</b>	Maintain and improve the existing transportation system through: <ul style="list-style-type: none"> <li>• Training</li> <li>• Resource management and prioritization</li> <li>• Best practices</li> <li>• Innovative solutions</li> </ul>	See, <i>Excellence in Transportation</i> (WYDOT, July 2007)		
<b>Exercise good stewardship of our resources.</b>	Wisely care for the natural and financial resources with which we have been entrusted.	See, <i>Excellence in Transportation</i> (WYDOT, July 2007)		





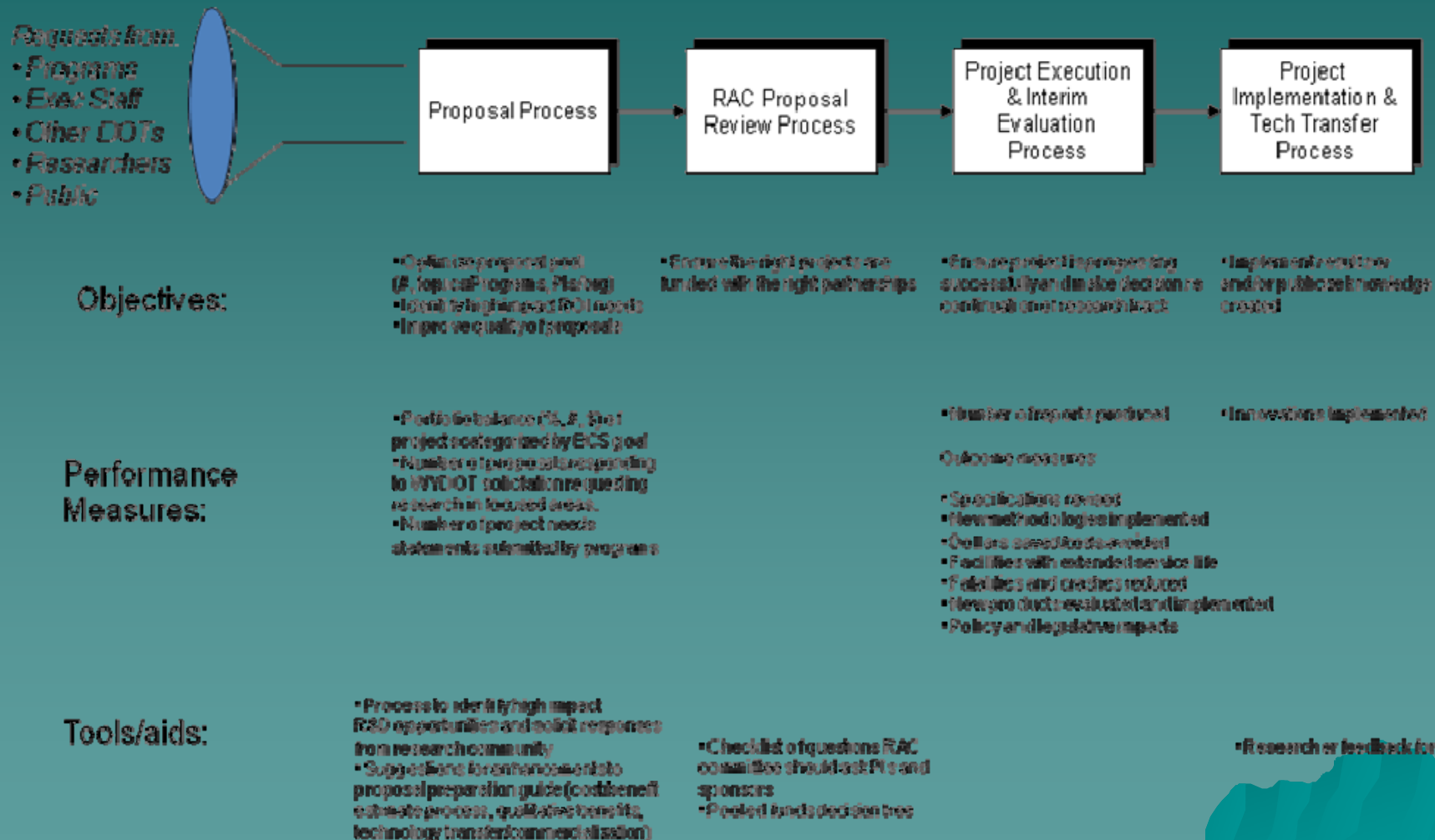
# Performance Measures

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- Ten performance measures were selected that comprise the proposed balanced scorecard for the Research program.
- Measures are comprehensive and coherent. They link research to the strategic plan through a research agenda and focus on outcomes (effectiveness) while also addressing process (efficiency)
- The measures provide WYDOT with a framework for continuous improvement, i.e. “Model, Measure, Manage...”.
- The measures are quantifiable and trends in these measures should be communicated through the *Annual Research Work Program* report.

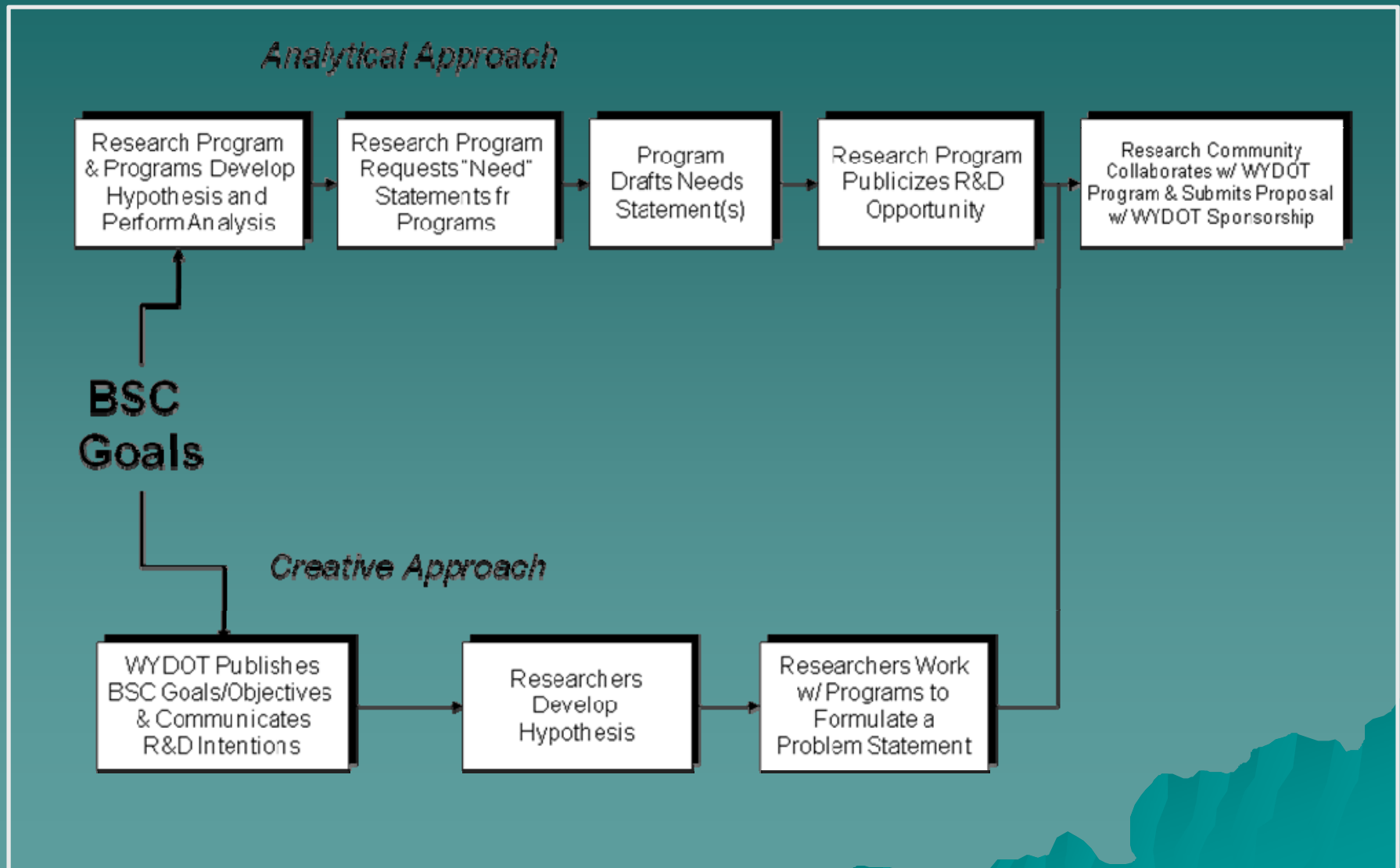


# Other Tools and Aids





# Linking Research and BSC





# Performance Measures

A 2001 NCHRP study *Performance Measures for Research and Technology Programs* and an accompanying companion product *Performance Measurement Tool Box and Reporting System for Research Programs and Projects* were used as a starting point in developing candidate performance measures.

Seventeen (17) candidate measures were divided among three categories. The measurement categories are described below:

**Strategic Portfolio Measures** – these measures reflect WYDOT policies which should define the research portfolio, e.g. mix of strategic vs. opportunistic projects, the balance of projects supporting different BSC goals, the distribution of funding across pooled funds vs. contracted vs. in-house projects.

**Project Output Measures** – these measures reflect the “success” or outputs given the resources expended on R&D, e.g. estimation of dollars saved, number of products “on the road”

**Program Efficiency and Management Measures** – these measures reflect the overall value of the program in terms of cost-benefit and how well it is managed in terms of administrative costs and adequacy of resources.



# Performance Measures

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These 17 **candidate** measures were reviewed individually and then collectively as a set of measures. Some measures are dependent on other measures. Several guiding principles for selecting candidate performance measures were:

- Use only a few measures
- Focus measures on outputs
- Measures should be understandable to upper management
- Some measures are for reporting while some may be for informational/internal purposes
- Measures should be measurable
- For each measure consider the cost/benefit of developing, recording and monitoring it



# Performance Measures

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Each performance measure was evaluated using the following context:

- Brief description of the candidate measure
- In several cases answers to the policy questions posed were needed to determine whether to adopt the measure. Consultation at the proper level within WYDOT was necessary to address these policy questions
- Comparison of the candidate measure with results of analysis of the overall Research program and the 64 projects in the data set and the 23 case studies
- Comments and recommendations on the applicability and other considerations of the candidate measure
- The proposed method to measure the candidate measure
- The suggested frequency of measuring and recording the candidate measure

# Performance Measures

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## Group 1 – Strategic Portfolio Measures

- 1.a. Funding by Strategic Intent
- 1.b. Number of Projects by Strategic Intent
  
2. Number of proposals responding to WYDOT solicitation (based on research agenda)
  
3. Number of needs statements submitted by Programs

# Performance Measures

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## Group 2 – Project Output Measures

1. Outcome of a project and its impact:
  - Specifications revised
  - New methodologies implemented
  - Dollars saved/costs avoided
  - Facilities with extended life
  - Crashes reduced
  - Fatalities reduced
  - New products evaluated and implemented
  - Policy and legislative impacts
2. Number of research reports completed each year and number of research reports not completed within three years.





# Performance Measures

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## Group 3 – Program Efficiency and Management Measures

1. Cost-benefit analysis for individual projects
2. Cost-benefit analysis for overall program
3. Percentage of Administrative costs to overall program funding
4. Funds requested by research community versus funds available
5. Percentage of projects completed on-time and within budget (internal tracking only).



# Review of Research Projects

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- Sixty-four projects funded between 1999 and 2007
- On-going and closed projects
- Captured data elements for each project:
  - Project description
  - Funding (expended or obligated)
  - WYDOT point of contact
  - Program sponsor
  - Start date
  - Completion date
  - Entity performing the research



# Research Idea Solicitation

- ◆ The modifications in the WYDOT Research process will allow Wyoming to open up the “market” on research ideas by:
  - Focusing on Strategic goals important to Wyoming.
  - Actively measure the outcomes (ROI) on the investment.
  - As the word gets out that we are responsive and focused it is believed more proposals will be generated. We may need to ask for more resource also.
  - It should allow Wyoming to more clearly document and implement results.