



0-6637-P1

**PROBLEM STATEMENTS REFLECTING HIGH IMPACT OR
RESEARCH OF VALUE TO TxDOT**

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Project 0-6637: Management Science Applications for TxDOT

AUGUST 30TH, 2011

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Performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.	



Research Problem Statement

RMC:	P	OPR: (for RTI use)		Project #: (for RTI use)	0-6637
Date:	08/28/2011			Research Program Year:	2012
Project Title:	Development of Performance Metrics to Assess Productivity and Forecast Staffing Needs				
RMC Priority:	What RMC research priority will this project address? Policies and practices to enhance organizational performance (RMCP)				
Project Description:	<p>What is the problem? TxDOT manages many resources with a small management staff and there are not productivity metrics to assess manager performance in order to forecast staffing needs. There is not an organized data structure to support a model based on performance metrics useful to develop staffing plans. The model will include manpower analysis of TxDOT core activities including design, construction, and maintenance. This research project will look at management science methods to forecast staffing needs and enhance productivity.</p> <p>Who is impacted by the problem? TxDOT Administration, Divisions and Offices, and Districts</p> <p>What is the significance / scope of the problem? All TxDOT Administration, Divisions and Offices, and Districts that are involved with making decisions in allocating resources and engaged in maintaining and preserving Texas's pavement infrastructure.</p> <p>What are the technical objectives of this project? Develop performance metrics to monitor manager performance, forecast staffing needs, and develop action plans and budgets.</p> <p>What benefits would this project deliver, and how would the results be used within TxDOT? It will significantly help TxDOT in best allocating resources and forecasting staffing needs based on performance metrics for productivity.</p> <p>What specific deliverables would help TxDOT implement the findings / results from this project? Complete documentation of work performed, methods used, and results achieved.</p>				

RMC:	P	OPR: (for RTI use)		Project #: (for RTI use)	0-6637
		<p>Includes a model based on productivity performance metrics to assess staffing needs and develop plans and budgets.</p> <p>Which District, Division, or Office would be responsible for implementing the results from this project? TxDOT Administration</p>			
Developed By:		<p>0-6637 Research Team</p> <p>For TxDOT employees only – Would you be willing to serve as the Project Director or as a Project Advisor, or can you suggest someone else knowledgeable about the problem / issue?</p>			
Submission:		<p>Email completed Problem Statements, as MS Word files, to rtimain@txdot.gov</p>			



Research Problem Statement

RMC:	P	OPR: (for RTI use)		Project #: (for RTI use)	0-6637
Date:	08/29/2011			Research Program Year:	2012
Project Title:	Development of a Methodology for Performance-based Compensation				
RMC Priority:	What RMC research priority will this project address? Policies and practices to enhance organizational performance (RMCP)				
Project Description:	<p>What is the problem? TxDOT manages a limited budget and there is a need to allocate financial resources in a more effective manner. An analysis on staff efficiency and productivity should be conducted to develop an analytical method to determine staff compensations based on performance. This research project will look at work load and functions, staff productivity to develop a methodology to formulate a payment compensation system.</p> <p>Who is impacted by the problem? TxDOT Administration, Divisions and Offices, and Districts</p> <p>What is the significance / scope of the problem? All TxDOT Administration, Divisions and Offices, and Districts that are involved with making decisions in allocating resources and engaged in management of personnel.</p> <p>What are the technical objectives of this project? Develop an organization performance assessment methodology to track work load and staff efficiency to pay compensations based on performance.</p> <p>What benefits would this project deliver, and how would the results be used within TxDOT? It will significantly help TxDOT in best allocating resources based on an organization performance assessment minimizing pay discrepancies among workers.</p> <p>What specific deliverables would help TxDOT implement the findings / results from this project? Complete documentation of work performed, methods used, and results achieved. Includes a model to pay compensations based on work load, efficiency, and productivity.</p> <p>Which District, Division, or Office would be responsible for implementing the results from this project?</p>				

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		TxDOT Administration			
Developed By:		0-6637 Research Team <u>For TxDOT employees only</u> – Would you be willing to serve as the Project Director or as a Project Advisor, or can you suggest someone else knowledgeable about the problem / issue?			
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Research Problem Statement

RMC:	2	OPR: (for RTI use)		Project #: (for RTI use)	
Date:				Research Program Year:	
Project Title:	Improved Internal Communication				
RMC Priority:	What RMC research priority will this project address? <ul style="list-style-type: none"> Planning and Environment (RMC 2) 				
Project Description:	<p>What is the problem? As an organization consisting of 25 districts, 21 divisions, and over 12,000 employees, internal communication is critical in the achievement TxDOT's goals. Communication problems can lead to poor efficiency, workplace problems, unbalanced workloads, etc.</p> <p>New technologies ranging from online networking tools to communication enabled hardware have an opportunity to increase the efficiency of specific activities. It is an important question, then, to identify which such tools can provide the right combination of implementation, cost and operational benefit.</p> <p>Ideally, an assessment of potential technologies, the communication challenges they could solve, and a benefit versus cost analysis would provide an invaluable resource for TxDOT when considering internal communication issues.</p> <p>Who is impacted by the problem? Streamlining internal communication protocols and reducing unnecessary bureaucracy has the potential to affect every division, district and employee in TxDOT.</p> <p>What is the significance / scope of the problem? The TxDOT staff is clearly its biggest asset, and making more efficient use of its workforce by minimizing the amount of time and effort wasted can result in incredible time savings and increases in productivity.</p> <p>What are the technical objectives of this project? The main objective of this project is to identify communication technologies that can improve and streamline the internal communications within TxDOT.</p> <p>What benefits would this project deliver, and how would the results be used within TxDOT? Communication technologies that are identified as beneficial for implementation, if adopted by TxDOT, could improve workforce efficiency and reduce bureaucracy.</p>				

RMC:	2	OPR: (for RTI use)		Project #: (for RTI use)	
		<p>What specific deliverables would help TxDOT implement the findings / results from this project?</p> <p>An evaluation of commercially available communication technologies and an assessment of their efficacy, and the challenges they can help solve under different circumstances, would allow TxDOT to address internal communication issues and, as such, provide a low cost opportunity for operational improvements.</p> <p>Which District, Division, or Office would be responsible for implementing the results from this project?</p> <p>Technology Services.</p>			
Developed By:		0-6637 Research Team			



Research Problem Statement

RMC:	1, 2, and P	OPR: (for RTI use)		Project #: (for RTI use)	
Date:				Research Program Year:	
Project Title:	Management of Design and Planning Processes				
RMC Priority:	What RMC research priority will this project address? <ul style="list-style-type: none"> • Construction and maintenance (RMC 1) • Improve construction and design analysis methods and procedures for economy and safety(RMC 2) • Policies and practices to enhance organizational performance (RMCP) 				
Project Description:	<p>What is the problem?</p> <p>Project planning and design at TxDOT includes development of construction projects from conception to the release of detailed plans for construction bidding. According to the TxDOT Roadway Design Manual, roadway design criteria and technology is a rapidly changing field of study. For example, traditional roadway project development is expanding to include consideration of the impact of project on various stakeholders such as non-facility users and the environment.</p> <p>As noted in the TxDOT Project Development Process Manual, during the development and design phase, the following tasks are performed:</p> <ul style="list-style-type: none"> - Planning and Programming - Preliminary design - Identifying a project's environmental variables and planning an appropriate level of public involvement. - Right of way utilities - Plan, Specification, and Estimation, (PS&E) development (i.e., detailed design) - Letting <p>Decisions made during the activities mentioned above, especially the PS&E development phase, will directly affect the project schedule and quality. The TxDOT Project Development Process Manual suggests that during this phase of the project, input from the project manager's peers and supervisor should be sought for quality assurance of the project development process. In light of that, TxDOT needs a management methodology at the project level to ensure that all project related issues are addressed. For example, there is a need to tie project level decisions with long-range advanced planning in order to determine long-term/ultimate impacts of projects.</p>				

As noted in the recent Grant Thornton review of TxDOT's management and organizational structure, the Department is overlooking the critical need to focus on stronger project management methodologies. With respect to the importance of the design and development phase, TxDOT needs to pay specific attention to management practices that enhance collaboration between project stages and project participants, as one of the issues frequently noted in assessments of TxDOT, as well as with the 0-6637 Management Science Scoping Study, is the fragmented advanced planning, design, and development activities. For example, the lack of control over determination of a defined scope before going into detailed design (or other sequential phases) has significant financial and project management ramifications.

Another important issue uncovered with the 0-6637 study was the need for improving the current methodology of the Planning and Programming, and Preliminary design phase. As noted in the TxDOT Project Development Process Manual, the following activities are currently performed during the Planning and Programming phase:

1. Needs Identification
2. Project Authorization
3. Compliance with Planning Requirements
4. Study Requirements Determination
5. Construction Funding Identification

Preliminary design phase also includes the following activities:

1. Design Concept Conference
2. Data Collection/Preliminary Design Preparation
3. Public Meeting(s)
4. Preliminary Schematic
5. Geometric Schematic
6. Value Engineering
7. Geometric Schematic Approval

Factors involved in these activities have a profound effect on subsequent stages of a project, and these factors should be addressed even in the absence of detailed information. In light of that, TxDOT needs to adhere to strong project management methods during advanced planning as well as the design phases.

Who is impacted by the problem?

As a project-driven organization, the entire TxDOT enterprise is impacted by improving management of design and planning processes. More specifically, such improvement will help TxDOT Planners at all levels.

What is the significance / scope of the problem?

The main focus of this study is on design and planning management at the project level. On average, over 800 construction contracts are bid by contractors each year. As reported in the TxDOT Tracker, for the fiscal year 2011, a target of 1,000 construction contracts with total value of \$4,541M, is set in state law. Through

February 2011, TxDOT had awarded a total of 342 contracts with a total of \$1,031M.

What are the technical objectives of this project?

The main objective of this project is to improve the current project management methodology for the design and development phase to address the issues mentioned above. Current research within and outside of the transportation industry has documented the importance of adequate and proper project management techniques and methods. This project proposes a comprehensive evaluation and assessment of TxDOT's project management process with a focus on how management science applications could enhance the efficiency and effectiveness of the organization.

What benefits would this project deliver, and how would the results be used within TxDOT?

Addressing the issues mentioned above will result in better collaboration between design activities, which will in turn result in improvement of the design decision making.

What specific deliverables would help TxDOT implement the findings / results from this project?

The TxDOT Project Development Process Manual may be updated with the findings.

Which District, Division, or Office would be responsible for implementing the results from this project?

Design Division

Developed By:	0-6637 Research Team
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Research Problem Statement

RMC: 2 and
P

OPR: (for RTI use)

Project #: (for RTI use)

Date:

**Research Program
Year:**

Project Title: Prioritizing Project for Financial Allocation

RMC **What RMC research priority will this project address?**

- Priority:**
- Procedures to enhance the planning and environment processes (RMC 2)
 - Policies and practices to enhance organizational performance (RMCP)

Project **What is the problem?**

Description: The construction and transportation industries have suffered excessively from the recent economic recession. As a result, significant emphasis has been placed on policies and procedures to identify and prioritize which projects to undertake when financial resources are constrained. Additionally, as noted in the TxDOT Strategic Plan, TxDOT needs a mechanism to “facilitate the development and exchange of comprehensive multimodal funding strategies with transportation program and project partners.” Limited funding highlights the importance of project prioritization and selection for an owner organization such as TxDOT.

In prioritizing projects, owner organizations have to consider different kinds of benefits that candidate projects would provide to the wide range of stakeholders. The issue of considering various stakeholders is of greater importance to agencies such as TxDOT. For example, as noted in assessments of TxDOT, as well as with the 0-6637 Management Science Scoping Study is that TxDOT should ensure that financial resources are allocated in areas that have documented needs as opposed to ad-hoc criteria.

Another issue that TxDOT faces is that in order to prioritize projects, vast amounts of information filter through different departments and need to be processed at different levels of the organization. In light of that, TxDOT needs to improve its portfolio management system on an enterprise level to optimize its projects based on criteria, addressing long-range and short-term considerations.

In allocation of funds, TxDOT also needs to take into account different types of projects (e.g., construction vs. maintenance), as well as organizational improvement actions conducted within the organization. For example, investing on improving administrative and support processes, such as internal communication and IT tools, may influence overall efficiency of the organization.

RMC: 2 and
P

OPR: (for RTI use)

Project #: (for RTI use)

Who is impacted by the problem?

The entire organization is impacted by improving current project prioritization and selection practices. Additionally, citizens of Texas would benefit from improvement in efficiency of funding strategies.

What is the significance / scope of the problem?

The grand total of the TxDOT budget for 2010-2011 is \$16.94B. 2.77% of this amount is devoted to the administration and support functions (i.e., \$0.47B). On the other hand, the budget requested for 2012-2013 is reported to be \$15.63B, \$0.47B of which is to be allocated to the administration and support functions. This emphasizes the importance of project prioritization and efficient use of available funds to support organizational improvement projects within TxDOT.

What are the technical objectives of this project?

The main objective of this project is to develop a decision-making tool to be used for project prioritization.

What benefits would this project deliver, and how would the results be used within TxDOT?

The decision-making tool will help TxDOT improve its overall financial efficiency and meet the needs of different project stakeholders.

What specific deliverables would help TxDOT implement the findings / results from this project?

A project prioritization decision-making tool and a manual describing how to use the tool will be developed.

Which District, Division, or Office would be responsible for implementing the results from this project?

Finance Division

Developed By: 0-6637 Research Team



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