



0-6637-P2

PROCEDURES FOR IDENTIFYING AND PRIORITIZING AREAS FOR CONTINUOUS IMPROVEMENT

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Project 0-6637: Management Science Applications for TxDOT

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Introduction

This document presents the systematic series of steps taken in order to identify potential areas of improvement in techniques for Operations Research and Management Science (OR/MS). The process used to determine the set of actionable research statements (produced as part of Project Deliverable P1) is a robust system that can be used to identify opportunities for improvement in the future. This multi-stage procedure is centered on incorporating the knowledge and experience of current TxDOT professionals, with the knowledge base of the OR/MS community, to identify the areas and activities of TxDOT that can realistically and significantly be improved with the incorporation of OR/MS techniques.

In order to identify opportunities within any organization, it is important to understand the specific challenges that the organization faces at each level of operations. The objective is to identify the challenges that are specific to TxDOT, based on the experience of its employees, and then focus on challenges where decisions have a big impact.

As such, we define the objective of the project as to identify challenges within the organization which satisfy two criteria:

- OR/MS techniques can be realistically implemented.
- The impact that implementation of OR/MS can have is large.

In order to develop an improvement program that allows TxDOT to continuously benefit from the application of OR/MS techniques, we propose to follow a threefold approach, including a continuous training component, periodical evaluation, and analysis procedures (Figure 1).

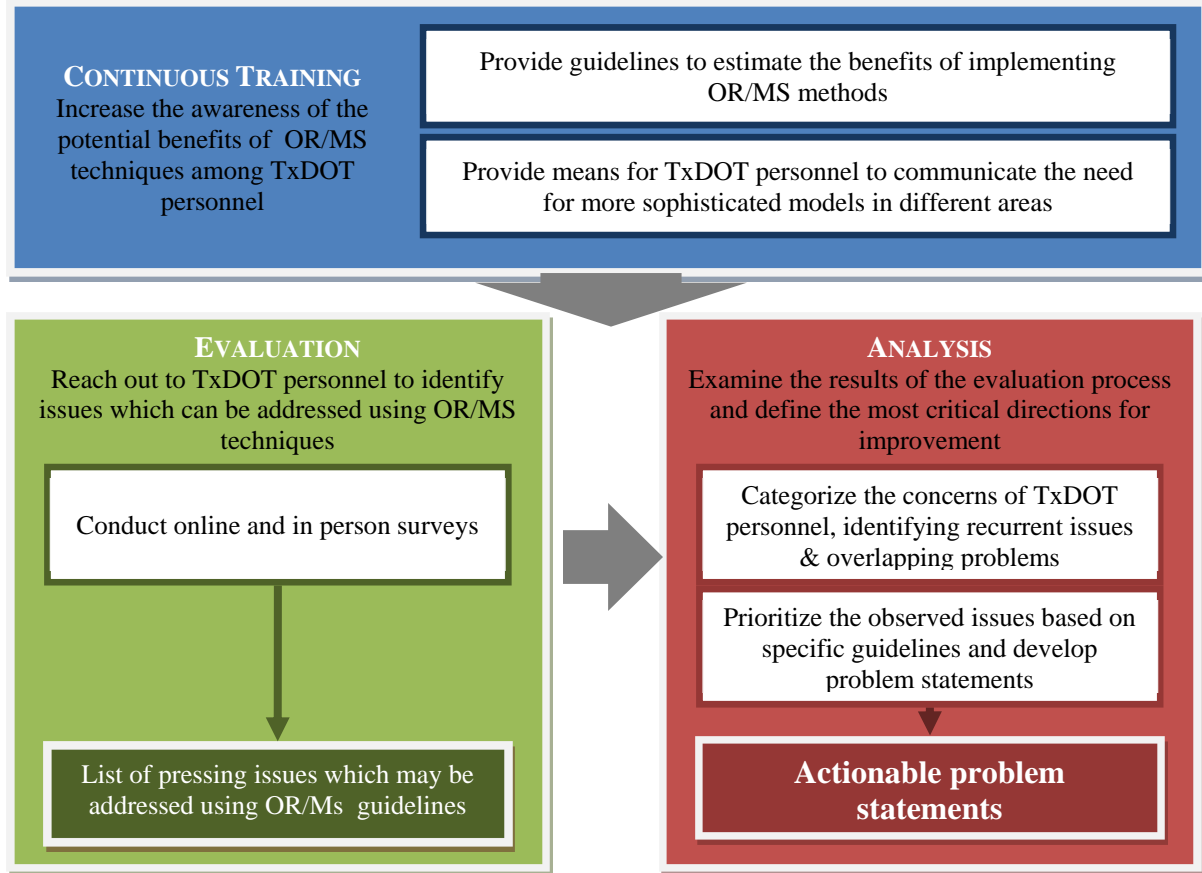


Figure 1: Proposed continuous improving program

Continuous Training

In order to guarantee that opportunities for implementation of OR/MS will be identified and subsequently implemented in a successful manner, it is important to provide TxDOT personnel at all levels with adequate training. Extensive OR/MS knowledge cannot be expected of every TxDOT employee. However, providing personnel with the necessary information to identify situations where benefits could be achieved through better analysis could greatly benefit TxDOT operations and improve efficiency.

While providing accurate estimates of the impact of OR/MS implementations in practice requires significant expertise, several factors demonstrate the potential for improvement. Some of these factors, listed below, may be used to develop guidelines to be distributed among TxDOT personnel.

- Current standards/practices
 - Decision processes that have not been re-evaluated in a long time.
 - Decision processes that are performed individually in spite of clear interdependencies.
- Complexity:
 - The decision requires the analysis of large sets of data.

- The decision process requires the selection of a large set of variables.
- The relationships between the individual choices are complex/not intuitive.
- Impact
 - The amount of money involved in the decision making process is high.
 - The decision affects a significant number of subsequent decisions.
 - The decision cannot easily be undone.
- Recent changes
 - Any factor in the evaluation of the decisions has changed.
 - New information is available that may help in the evaluation process.
 - New priorities have emerged.
 - New limitations and/or constraints have been imposed on the decisions.
- Potential for Improvement
 - There is evidence that significant improvements can be made, based on previous experiences within the organization or within similar organizations.
 - New technologies or tools exist that can be used to better analyze or otherwise use available resources.
 - The synergetic improvement coming from considering two or more previously independent decisions as a joint system of decisions is sizeable.
- Frequency
 - The final decision made will affect an operation that is repeated many times.

It is crucial to provide avenues of communication to allow personnel to communicate the need for more sophisticated forms of analysis.

While it falls outside the scope of this project, the development of a program to educate TxDOT personnel in the process of identifying, documenting and communicating opportunities for improved efficiency could be invaluable to the organization.

Evaluation

OR/MS focuses on providing, through a systematic process, analytical support for decision makers. As such, in order to identify opportunities for successful implementation of OR/MS, we must identify problems within TxDOT where the decisions and choices made have a distinct and significant effect on performance.

In order to identify potential applications of OR/MS techniques, it is critical to exploit the collective knowledge base that is the TxDOT staff. As TxDOT personnel have firsthand experience with the challenges and problems faced by the organization, their input is invaluable in identifying activities and processes within the organization that satisfy the criteria required. To achieve this, the research team prepared and distributed a survey to TxDOT personnel. The aim of the survey was to provide an opportunity for personnel to identify areas that could benefit from analytical research and improved operational efficiency. The interest in the results of the survey is twofold:

1. To identify the superset of operational and analytical issues faced by the organization.
2. To determine which issues are common to more than one unit, whether organizational or geographical.

The questions contained in the survey, the follow-up scoping study questionnaires, and the survey results are included in Appendices A, B, and C. These templates can be used as a starting point for future improvement review endeavors.

Analysis

Once the results from the survey are obtained, the objective is to group concerns raised by different respondents into a more manageable number of categories where each category represents one general group of organizational challenges that can benefit from improved OR/MS analysis. The categories developed as part of this research project, which can be used or improved upon in future endeavors, are:

- Planning/design/project management methods
- Financial allocation control and cost tracking
- Planning/design methods
- Workload imbalances
- Project prioritization and financial allocation
- Communication (internal)
- HR forecasting methods
- Equipment forecasting methods
- Communication (external)
- Cross-training

The goal of categorizing the issues identified in the surveys is to develop a general idea of which general set of problems are considered important, in hopes that methods can be developed which address multiple issues simultaneously, thus guaranteeing higher impact of proposed research problem statements.

As part of this project, the general sets of problems that were considered important are depicted in Table 1.

Table 1. Problems identified in survey

	Title	Interview Notes	Summary statement	Problem type
1.1	Utility accommodation and right of way acquisition	Analyze and quantify potential savings through improved procedures regarding eligible utility accommodations. Prepare best-practice recommendations to assure utility conflict analysis is performed and captured, that independent agency estimates of cost and duration of utility installations are developed and establish procedures for point-of-delivery inspection of utility accommodations completed to certify legitimate costs incurred.	Utility accommodations	Planning/design/project management methods
1.2		Utility costs when it comes to ROW - those costs are in the millions of dollars, they don't hit at one time; I know they're working on that, but they need to come up with a plan.	Right of way acquisition services	
1.3		Utility costs-TxDOT goes out and wants to build a road on a certain piece of land, and utilities need to be rerouted around it; they don't get us a bill in the same year the work was done, charges end up being more than the original agreement; forecasting needs to be done.	Utility cost contract agreements	
2.1	Work load and productivity analysis for forecasting future staffing needs	Study to determine what productivity/production metrics are the most important. Will soon be working with smaller management staff – need to determine how to assess manager performance and what factors matter. Current performance metrics not developed in-house. Current model is to run to failure.	Forecasting staffing needs at the managerial level based on productivity	HR forecasting methods
2.2		Ability to look at current staffing needs and forecast base on projected budgets and rate of turnover/retirements, etc.	Forecasting staffing needs	
2.3		Develop staffing plans for engineers 2014 and out – currently use People Solve to ID current slots but no	Forecasting staffing needs	

	Title	Interview Notes	Summary statement	Problem type
2.4		way to assess/forecast future needs using hypothetical info, etc. Manpower analysis of core activities (construction, maintenance, design) to understand how many hours each task needs.	Workload analysis	
3.1	Work load analysis for performance-based compensation	work load analysis or work function analysis. Down to the level of MBA, how much productivity does each person have and how does that factor into the system? Big goal is aligning the number of people to the functions they perform.	Work load analysis - Staff efficiency	Workload imbalances
3.2		Statistical model to identify pay discrepancies (gender and under-represented workers for equity adjustments – no current process to analyze	Pay discrepancies	
3.3		Organization as a whole would benefit from a whole organization performance assessment – for some jobs classifications (engineers for example) no defined levels of performance. Anecdotal evidence is that some districts and individuals outperform others. What is average, what is acceptable? Goes to shared services – how to track and define. What metrics do you use? Are there industry standards?	Whole organization performance assessment	
4.1	Right of way acquisition management (time/cost)	Calculate the average time in-process for components of right of way acquisition services delivery to analyze the correlation if any with the extent and length of time given to right of way considerations in advance project planning, scoping and development.	Right of way acquisition services	Planning/design/project management methods
4.2		Utility costs when it comes to ROW - those costs are in the millions of dollars, they don't hit at one time; I know they're working on that, but they need to come up with a plan	Right of way acquisition services	

	Title	Interview Notes	Summary statement	Problem type
5.1	Management of design and planning processes	TxDOT knows how much time needed for detailed design but does not have a process for schematic design and advanced planning, etc.	Schematic design and advanced planning	Planning/design/project management methods
5.2		Lack of control over determination of a defined scope before going into detailed design (or other sequential phases?) Need assistance in scope definition process.	Detailed design	
5.3		Do not consider long-term/ultimate impacts of specific projects. Widen once and then might come back in a few years and widen again. Is there a better way to tie long range advanced planning with corridor to project level decisions? Could we optimize each project to make determinations on what it ultimately could be within a given future timeframe	Right of way acng-term/ultimate impacts of specific projects. Acquisition services	
6.1	Project prioritizing for financial allocation	Our method of allocating transportation dollars – making sure that we’re allocating in areas that really need it as opposed to just political needs	Funding strategies	Financial allocation and cost tracking
6.2		Definitely see portfolio management on an enterprise level – I know efforts are being done to optimize funding, but finding optimal projects to go with that funding is not being done. Asking “are these really most important projects that we’re spending money on?”	Funding strategies	
6.3		Maintenance on the front side (in first question, it was maintenance from the back end) – putting more emphasis into which projects, making sure we’re getting those right projects, kind of back to portfolio maintenance, there is more road maintenance. Asking, “are we maintaining the most important things?”	Funding strategies	
6.4		project prioritization – what is the best use of the limited funding we have, that goes into not only construction projects, (the focus of TxDOT is	Funding strategies	

	Title	Interview Notes	Summary statement	Problem type
		construction), but we also have multi-million dollar IT projects and many of them. And we have little bitty ones too.		
7.1	Enhancing internal communication by using IT tools and improving processes by reducing unnecessary paper work	Use of technology for reduction of unnecessary paper work to increase efficiency. For example, using economical hand-held devices in this project helped inspectors measure and record placements in the field. This increased efficiency of inspectors and people above them who had to review their work.	Collaborative project management solutions	Communication (internal)
7.2		Reduce the unnecessary paperwork and bureaucracy by streamlining work processes as well as adopting new technologies	Collaborative project management solutions	
7.3		Establish better statewide communication strategies (e.g., using Skype, instant messaging, texting)	Collaborative project management solutions	
7.4		It all starts from administration. There needs to be more of a collaborative effort versus a dictatorial effort, making sure that you are including all the affected parties and possible affected parties. Give people opportunity to say, “nope that won’t work,” before making sweeping policy changes.		
7.5		Severe lack of communication, and there’s a trust issue. You can send messages 24/7, but if people don’t trust the source of the information – it achieves nothing. If there is communication, but the stakeholders do not have trust, they’re not going to listen. Respect is earned – people have to maintain it and earn it.		

Once a general issue is identified, the following set of questions must be answered in order to identify problems that can produce high impact, actionable research problem statements:

- Can the benefits of addressing the issue at hand be easily quantified?
- Will the benefits of addressing the issue at hand affect multiple areas in TxDOT?
- Will the benefits of addressing the issue at hand have positive effects for a long period of time?
- Is there evidence of successful implementations of OR/MS within TxDOT to address the issue at hand?
- Is there evidence of situations where the issue at hand has had a negative impact?

As an example, we provide a case study detailing the process followed to create one of the Problem Research Statements developed for deliverable P1.

Case study: Internal Communication

As answers to the question “What three issues or questions relating to your area must need (more) analytical research?” and “Likewise, for the Department as a whole, what three issues/questions most deserve analytical research?” yielded the following questions, which can be identified as issues of internal communication, i.e. communication within the organization.

Use of technology for reduction of **unnecessary paper work** to increase efficiency. For example, using economical hand-held devices in this project helped inspectors measure and record placements in the field. This increased efficiency of inspectors and people above them who had to review their work.

Reduce **the unnecessary paperwork** and bureaucracy by streamlining work processes as well as adopting new technologies

Establish better statewide communication strategies (e.g., using **Skype, instant messaging, texting**)

It all starts from administration. There needs to be more of a collaborative effort versus a dictatorial effort, making sure that you are including all the affected parties and possible affected parties. **Give people opportunity to say, “nope that won’t work,” before making sweeping policy changes.**

Severe lack of communication, and there’s a trust issue. You can send messages 24/7, but if people don’t trust who or from what the information is coming down – it does nothing. You can have a lack of communication, but if people don’t trust who it’s coming from, they’re not going to listen. Respect is earned – people have to maintain it and earn it.

While the four statements don’t all necessarily tackle the same communication issue, it is clear that several important decision makers consider a focus on more streamlined, updated communication strategies important. Once an issue has been identified, we must identify the possibility that addressing such an issue will result in significant improvements for TxDOT.

Can the benefits of addressing the issue at hand be easily quantified?

In the case of internal communication issues, it is not clear how to quantify the benefits of improvement.

Will the benefits of addressing the issue at hand affect multiple areas in TxDOT?

Improving internal communication has the potential to affect every area of TxDOT, as all activities within the organization hinge on efficient and timely communication.

Will the benefits of addressing the issue at hand have positive effects for a long period of time?

It is clear that improved internal communications would have a long lasting positive effect in the organization.

Is there evidence of successful implementations of OR/MS within TxDOT to address the issue at hand?

As mentioned by one of the respondents, although at a smaller scale, successful implementation of handheld devices for more efficient communication had very positive results.

Is there evidence of situations where the issue at hand has had a negative impact?

While individual events could be pinpointed, it is not necessary as internal communication issues can have a part in a great number of operational issues.

Having answered these questions, it becomes clear that the problem of streamlining and improving internal communications can have far reaching and significant implications, and as such, should be considered as a potential research problem statement. Appendix E shows the RPS developed as part of deliverable P1.

Appendix A: Task 4 Survey Script

Welcome!

Thank you for your willingness to participate in this survey about resource usage within your division at the Texas Department of Transportation (TxDOT). Your participation in this survey is entirely voluntary. You may choose not to answer a question if you feel uncomfortable. This survey will take approximately one hour of your time to complete. The Human Subjects' Protection Program and/or the Institutional Review Board at Texas A&M University have reviewed this research study. For research-related problems or questions regarding your rights as a research participant, you can contact these offices at (979)458-4067 or irb@tamu.edu. For questions about this survey specifically, please call Christine Yager at (979)845-6528.

Please click NEXT when you are ready to begin the survey.

Demographic Information

1. Please specify the administration unit, division, or office in which you work:

2. What is your current job title?

3. What is your gender?

☐

Male

☐

Female

4. What is your age?

☐

19 or under

☐

20-29

☐

30-39

☐

40-49

- ☐ 50-59
- ☐ 60 or over

5. What is your highest level of education?

- ☐ High school or equivalent
- ☐ Certificate or training program
- ☐ Associate
- ☐ Bachelors
- ☐ Masters
- ☐ Doctorate
- ☐ Other (please specify)

6. How long have you been working for TxDOT?

- ☐ Less than a year
- ☐ 1 - 2 years
- ☐ 2 - 5 years
- ☐ 5 - 10 years
- ☐ More than 10 years
- ☐ Other (please specify)

7. How many years have you been at your current position?

- ☐ Less than a year
- ☐ 1 - 2 years
- ☐ 2 - 5 years
- ☐ 5 - 10 years
- ☐ More than 10 years

☐ Other (please specify)

8. What is your current job function? (Mark all that apply)

- ☐ Executive Director
- ☐ Deputy Executive Director
- ☐ Assistant Executive Director
- ☐ Manager
- ☐ Supervisor
- ☐ Coordinator
- ☐ Analyst
- ☐ Technician
- ☐ Specialist
- ☐ Engineer
- ☐ Auditor
- ☐ Inspector
- ☐ Other (please specify)

9. Did you have any experience in the private sector prior to joining TxDOT?

- ☐ Yes
- ☐ No

10. Before joining TxDOT, how many years of experience relevant to your current position did you have from non-TxDOT organizations or the private sector?

- ☐ Less than a year
- ☐ 1 - 2 years
- ☐ 2 - 5 years

- ☐ 5 - 10 years
- ☐ More than 10 years
- ☐ Other (please specify)

Current State

For the purposes of this survey, **management sciences** (also known as operations research or decision sciences) is defined as “***A scientific approach to decision making, which seeks to determine how best to design and operate a system, usually under conditions requiring the allocation of scarce resources.***”

According to the TxDOT strategic plan for the fiscal years 2011-2015 periods, the following goals are specified to be main areas of future actions and focus:

Goal 1 – Organizational structure and strategies:

- Develop a proactive internal and external communication plan that fosters transparency
- Develop a comprehensive performance management program to enhance program evaluation, decision making, resource utilization, and product delivery
- Develop and nurture partnerships with communities, agencies and other transportation stakeholders
- Enhance workforce recruitment, retention, and leadership development efforts

Goal 2 – Enhance safety for all Texas transportation system users:

- Reduce fatalities and serious injuries on the Texas transportation system
- Partner with public and private entities to plan for, coordinate, and respond to disasters and emergencies
- Promote work zone safety to protect roadway workers and the traveling public
- Measure, monitor, and report performance in improving safety

Goal 3 – Maintain the existing Texas transportation system:

- Develop optimal asset management programs to protect existing infrastructure investments
- Ensure timely and effective emergency maintenance response and damage repair
- Measure, monitor, and report performance in maintaining the existing transportation system

Goal 4 – Promote congestion relief strategies:

- Implement multimodal infrastructure, operational and technological solutions to address congestion and mobility needs
- Focus congestion relief efforts on the most severely congested elements of the state transportation system
- Measure, monitor, and report performance in providing congestion relief

Goal 5 – Enhance system connectivity:

- Ensure Texas industries can efficiently access statewide, regional, national, and international markets and gateways
- Provide coordinated, multimodal transportation facilities and networks to connect all statewide population, economic, recreational, and cultural centers
- Measure, monitor, and report performance in enhancing system connectivity

Goal 6 – Multimodal funding strategies:

- Assess and document transportation system needs and available revenues in periodic updates of the long-range Texas Transportation Plan
- Explore all available multimodal financing options while not recommending any particular strategy
- Regularly communicate with the Texas public about the program results that come from maximizing existing funding levels as well as the consequences of alternative future funding levels

11. Has your division/office conducted any efforts or programs in the management sciences toward any of these goals? Please specify your answers in the table below:

	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
Yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't know	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Please describe the efforts or programs your division/office has conducted in the management sciences (operations research, decision sciences):

Goal 1:

Goal 2:

Goal 3:

Goal 4:

Goal 5:

Goal 6:

13. Do internal procedures exist to systematically evaluate methods to optimize your division's/office's performance?

- ☐ Yes
- ☐ No
- ☐ I Don't Know

14. If Yes, please describe the internal procedures that exist to systematically evaluate methods to optimize your division's/office's performance.

15. Who is responsible for operational efficiency/change within your division/office?

Please review the following list of organizational units within TxDOT.

- **Finance**
- **Strategic policy and performance management**
- **Field and district operations (25 Districts)**
 - o Construction
 - o Maintenance
 - o Traffic operations
- **Engineering operations (Divisions)**
 - o Aviation
 - o Bridge
 - o Design
 - o Environmental affairs
 - o Rail
 - o Research and technology implementation
 - o Right of way
 - o Transportation planning and programming
 - o Turnpike authority
- **Support operations**
 - o Civil rights
 - o General services
 - o Human resources
 - o Motor carriers
 - o Occupational safety
 - o Public transportation
 - o Technology Services
 - o Travel information

16. What specific units within TxDOT do you think have the highest influence on the achievement of the six goals (Mark all that apply)?

	Finance	Strategic policy and performance management	Field and district operations	Engineering operations	Support operations
Goal 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Goal 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Opinions of Current State

17. If you were given a highly-competent analyst for six months, what three issues or questions relating to your operations would you have them research?

18. Likewise, for the Department as a whole, what three issues/questions most deserve analytical research?

19. Also for the Department as a whole, what issue (or possible future development) particularly concerns you, but which you feel is generally under-appreciated?

For the purposes of this survey, **management sciences** (also known as operations research or decision sciences) is defined as ***“A scientific approach to decision making, which seeks to determine how best to design and operate a system, usually under conditions requiring the allocation of scarce resources.”***

According to the TxDOT strategic plan for the fiscal years 2011-2015 periods, the following goals are specified to be main areas of future actions and focus:

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- Enhance workforce recruitment, retention, and leadership development efforts

Goal 2 – Enhance safety for all Texas transportation system users:

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- Measure, monitor, and report performance in improving safety

Goal 3 – Maintain the existing Texas transportation system:

- Develop optimal asset management programs to protect existing infrastructure investments
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- Provide coordinated, multimodal transportation facilities and networks to connect all statewide population, economic, recreational, and cultural centers
- Measure, monitor, and report performance in enhancing system connectivity

Goal 6 – Multimodal funding strategies:

- Assess and document transportation system needs and available revenues in periodic updates of the long-range Texas Transportation Plan
- Explore all available multimodal financing options while not recommending any particular strategy
- Regularly communicate with the Texas public about the program results that come from maximizing existing funding levels as well as the consequences of alternative future funding levels

20. What specific areas/programs within your division/office would gain the most from an improvement in efficiency?

21. Regarding the six goals from the strategic plan, please rate the effectiveness of the current work practices of your division/office in achieving each goal.

Please specify your answers in the table below according to this criteria:

NEEDS IMPROVEMENT: current work practices of your division/office are poorly in line with the specified goal and needs improvement to achieve the specified goal

FAIR: current work practices of your division/office are somewhat in line with the specified goal

GOOD: current work practices of your division/office are in line with the specified goal

	Good	Fair	Needs Improvement
Goal 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. How would you rate your division's/office's financial efficiency within the context of the six goals?

(Financial efficiency: The extent to which available financial resources are well used to create specific outcomes in support of each long-term goal, with minimum amount of waste or unnecessary effort.)

	Excellent	Above Average	Average	Below Average	Poor
Goal 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Goal 6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. How would you rate TxDOT's overall organizational efficiency?

- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor
- ☐ Very Poor

24. Why do you think TxDOT's overall organizational efficiency is what you selected in the previous question?



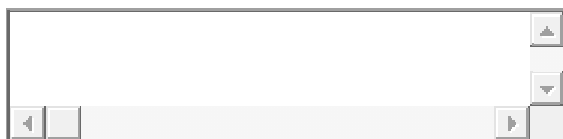
25. How would you rate TxDOT's overall financial efficiency?

(Financial efficiency: The extent to which available financial resources are well used to create specific outcomes in support of each long-term goal, with minimum amount of waste or unnecessary effort.)

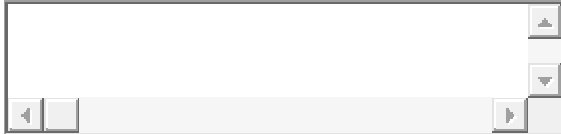
- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor
- ☐ Very Poor

26. Why do you think TxDOT's overall financial efficiency is what you selected in the previous question?

(Financial efficiency: The extent to which available financial resources are well used to create specific outcomes in support of each long-term goal, with minimum amount of waste or unnecessary effort.)



27. What part of the TxDOT organization needs to be improved most in terms of efficiency? Why?



Recommendations

For the purposes of this survey, **management sciences** (also known as operations research or decision sciences) is defined as “***A scientific approach to decision making, which seeks to determine how best to design and operate a system, usually under conditions requiring the allocation of scarce resources.***”

According to the TxDOT strategic plan for the fiscal years 2011-2015 periods, the following goals are specified to be main areas of future actions and focus:

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- Measure, monitor, and report performance in improving safety

Goal 3 – Maintain the existing Texas transportation system:

- Develop optimal asset management programs to protect existing infrastructure investments
- Ensure timely and effective emergency maintenance response and damage repair
- Measure, monitor, and report performance in maintaining the existing transportation system

Goal 4 – Promote congestion relief strategies:

- Implement multimodal infrastructure, operational and technological solutions to address congestion and mobility needs
- Focus congestion relief efforts on the most severely congested elements of the state transportation system
- Measure, monitor, and report performance in providing congestion relief

Goal 5 – Enhance system connectivity:

- Ensure Texas industries can efficiently access statewide, regional, national, and international markets and gateways
- Provide coordinated, multimodal transportation facilities and networks to connect all statewide population, economic, recreational, and cultural centers
- Measure, monitor, and report performance in enhancing system connectivity

Goal 6 – Multimodal funding strategies:

- Assess and document transportation system needs and available revenues in periodic updates of the long-range Texas Transportation Plan
- Explore all available multimodal financing options while not recommending any particular strategy
- Regularly communicate with the Texas public about the program results that come from maximizing existing funding levels as well as the consequences of alternative future funding levels

28. What suggestions do you have for efforts or programs your division/office should conduct in the management sciences in general and also within the context of the six goals?

(You may draw from any past experience you have, whether from private sector or experience at TxDOT.)

In General:

Goal 1:

Goal 2:

Goal 3:

Goal 4:

Goal 5:

Goal 6:

29. What suggestions would you make to improve the financial performance of your division/office?

30. What suggestions would you make to improve the financial performance of TxDOT as a whole?

31. How do you think resources for the following TxDOT expenditure categories are currently allocated?
(Please specify the percentage of resource allocation.)

Planning:	<input type="text"/>
Building:	<input type="text"/>
Maintaining:	<input type="text"/>
Others categories:	<input type="text"/>

These are the current allocations. What do you recommend? (Enter your recommendations in the next question.)

Category	Current allocation (% of operating expenses)	Recommended allocation (% of operating expenses)
Planning	19.1	
Building	40.4	
Maintaining	35.5	
Other categories	5.0	
TOTAL	100%	100%

32. How do you recommend allocating resources for the following TxDOT expenditure categories?

(Please specify the percentage of resource allocation.)

Planning:

Building:

Maintaining:

Others categories:

According to the TxDOT strategic plan for the fiscal years 2011-2015 periods, the following goals are specified to be main areas of future actions and focus:

Goal 1 – Organizational structure and strategies:

- Develop a proactive internal and external communication plan that fosters transparency
- Develop a comprehensive performance management program to enhance program evaluation, decision making, resource utilization, and product delivery
- Develop and nurture partnerships with communities, agencies and other transportation stakeholders
- Enhance workforce recruitment, retention, and leadership development efforts

Goal 2 – Enhance safety for all Texas transportation system users:

- Reduce fatalities and serious injuries on the Texas transportation system
- Partner with public and private entities to plan for, coordinate, and respond to disasters and emergencies
- Promote work zone safety to protect roadway workers and the traveling public
- Measure, monitor, and report performance in improving safety

Goal 3 – Maintain the existing Texas transportation system:

- Develop optimal asset management programs to protect existing infrastructure investments
- Ensure timely and effective emergency maintenance response and damage repair
- Measure, monitor, and report performance in maintaining the existing transportation system

Goal 4 – Promote congestion relief strategies:

- Implement multimodal infrastructure, operational and technological solutions to address congestion and mobility needs
- Focus congestion relief efforts on the most severely congested elements of the state transportation system
- Measure, monitor, and report performance in providing congestion relief

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- Ensure Texas industries can efficiently access statewide, regional, national, and international markets and gateways
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Goal 6 – Multimodal funding strategies:

- Assess and document transportation system needs and available revenues in periodic updates of the long-range Texas Transportation Plan
- Explore all available multimodal financing options while not recommending any particular strategy
- Regularly communicate with the Texas public about the program results that come from maximizing existing funding levels as well as the consequences of alternative future funding levels

33. What level of financial resources within each expenditure category do you think should be apportioned to each of the six goals for TxDOT? (Check all that apply)

LOW: I think a LOW amount of financial resources should come from this expenditure category for the execution of this goal

MEDIUM: I think a MEDIUM amount of financial resources should come from this expenditure category for the execution of this goal

HIGH: I think a HIGH amount of financial resources should come from this expenditure category for the execution of this goal

	Planning	Building	Maintaining	Other categories
Goal 1				
Goal 2				
Goal 3				
Goal 4				
Goal 5				
Goal 6				

34. What specific units within TxDOT do you think should be in charge of the six goals? (Check all that apply)

LOW: I think this organizational unit should have LOW influence/control over the execution of this goal

MEDIUM: I think this organizational unit should have MEDIUM influence/control over the execution of this goal

HIGH: I think this organizational unit should have HIGH influence/control over the execution of this goal

	Finance	Strategic policy and performance management	Field and district operations	Engineering operations	Support operations
Goal 1					
Goal 2					
Goal 3					
Goal 4					
Goal 5					
Goal 6					

35. Do you have any other comments, suggestions, or questions related to any of the topics from this survey?

Appendix B: Summary of Task 4 Survey

There were four major sections that were developed for the survey:

- Demographic and Employment Information
- Current State of Organization
- Opinions of Current State
- Recommendations

The first part of the survey addressed demographic and descriptive information of survey participants, including their role and position in the organization, education, and factors influencing work experience. This information helped the research team identify the participants and divisions for follow-up interviews.

The next section of the survey focused on the extent to which scientific approaches for decision-making are currently being used in the organization. To classify focus areas, this section used the six overall organizational goals that the TxDOT strategic plan for fiscal years 2011-2015 specifies as main areas of future actions.

Prioritizing and identifying improvement areas was the major focus of the third section of the survey. Questions aimed to gather information on specific managerial challenges and capture respondents' evaluations of the organizational effort and efficiency within the context of each of the six major goals.

The last section of the survey focused on participants' recommendations as to what specific managerial solutions might be used to help the organization achieve its long-term goals. Questions asked for suggestions of improvement actions to enhance overall efficiency at division and organizational levels. Several questions addressed the allocation of the organization's financial resources within four main groups of managerial activities: planning, building, maintaining, and other activities. The questions aimed to identify the difference between the current allocation and what respondents think should be allocated. This information helped the research team in prioritizing management solutions identified in the previous tasks of the project.

A cover letter was developed and sent along with an invitation to complete the survey online via Survey Monkey®.

Demographic Summary

The survey was conducted via Survey Monkey online, with the option to complete a PDF version at the respondent's leisure. There were nine participants who completed the survey: seven males, one female, and one blank response. Except for one blank response, participants were split between two age groups: four 40-49 and four 50-59. Education backgrounds were mostly bachelor's, with only one master's and one doctorate. Listed below are all the administrative units that completed the survey (alphabetical order):

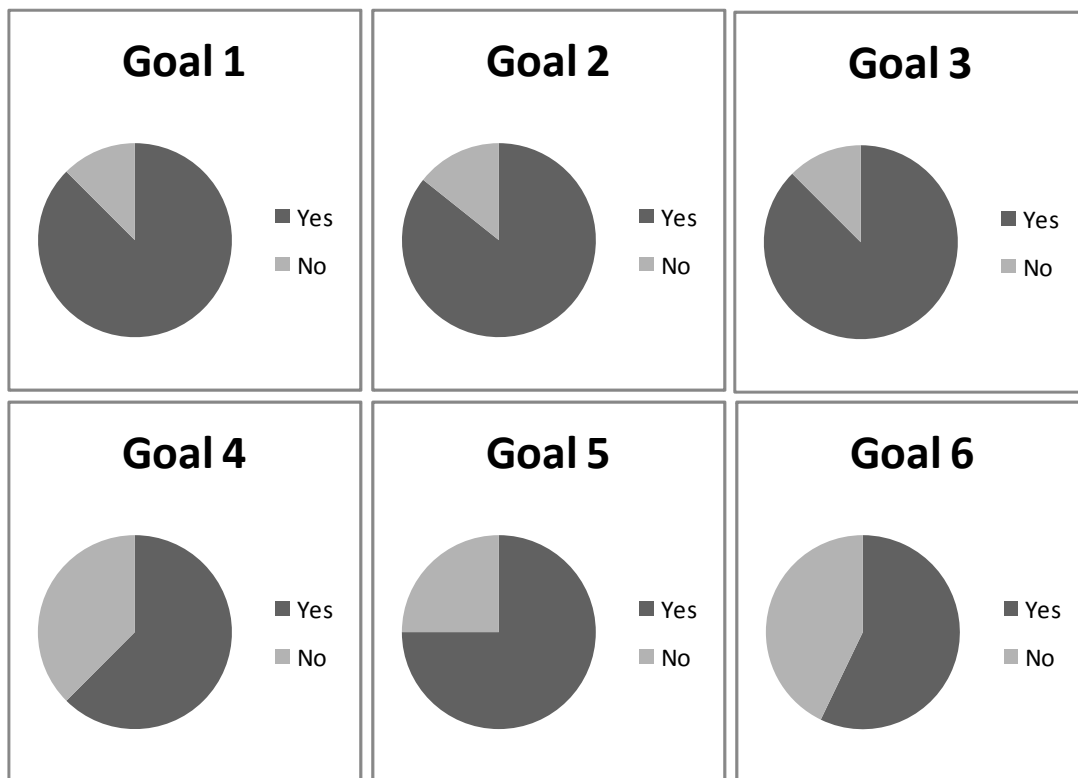
- 31 RCN
- AMA
- District office

- Division
- El Paso District
- Laredo District
- TYL
- Tyler District
- (Blank)

Six participants were district engineers, two were directors, and one was a blank response. Of the participants who responded, 100% have worked for TxDOT for more than 10 years. Three participants have been at their current position for 2-5 years, four for 5-10 years, and one for more than 10 years.

Current State of Organization

The purpose of these questions was to ascertain if any management science principles are currently being used at TxDOT. The first question asked participants with respect to the six main TxDOT strategic goals if their division has conducted any efforts in the management sciences. The figure below shows the results of this question.



Participants were then asked to describe the efforts their division has conducted in the management sciences. With respect to each strategic goal, all raw responses are listed in the table below.

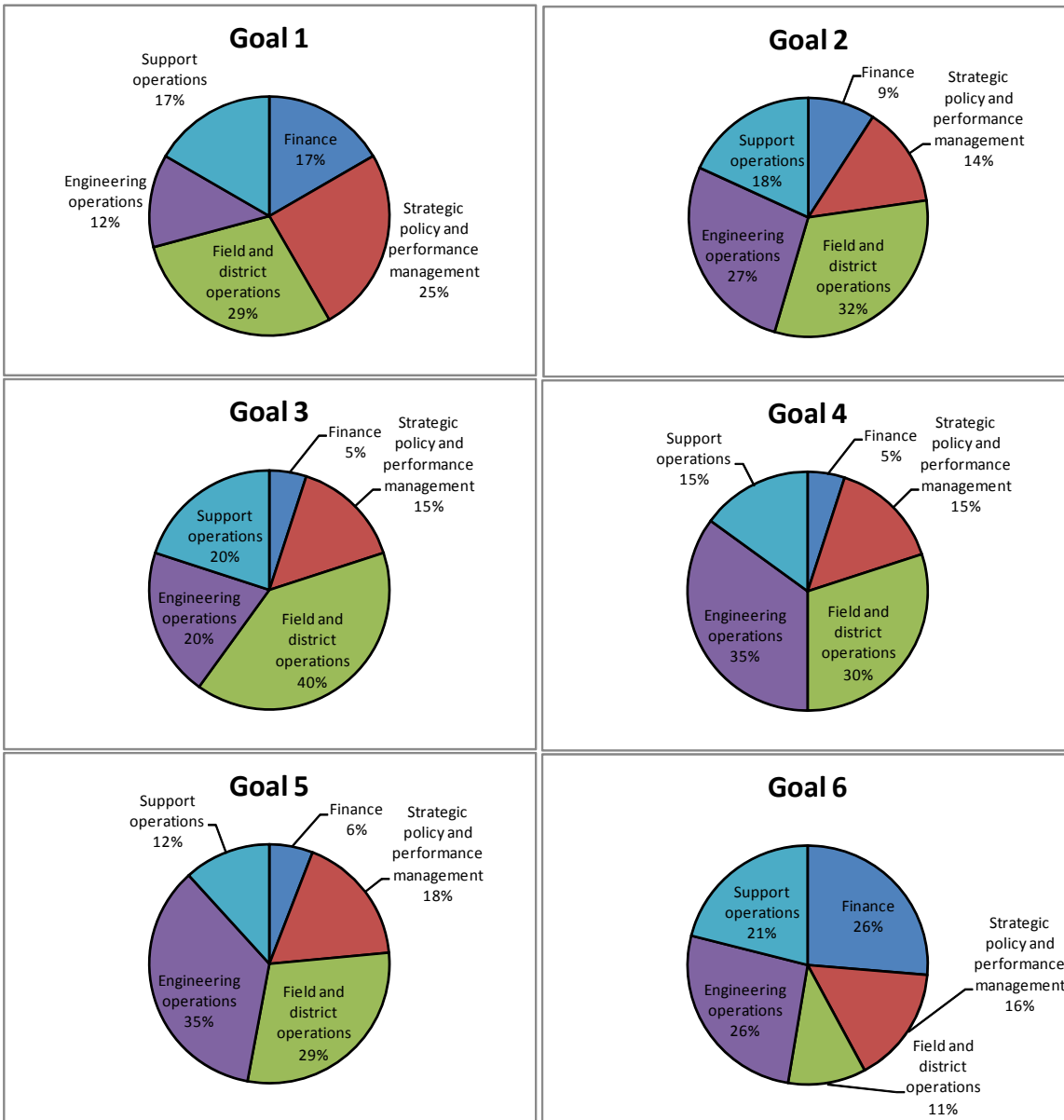
Goal 1	<ul style="list-style-type: none"> • Annual interaction with elected official. Information sharing meeting every other year • Traffic Safety Programs • One Dot Staffing Plan for District. Quarterly meetings with staffs of major cities within District. Continual involvement and coordination with 2 MPOs in the District. • Decision sciences • One DOT Staffing plan 24 month letting schedule work • PDP-2012 • Surveys and emails Blast
Goal 2	<ul style="list-style-type: none"> • Fatal/incap accident review team. Hurricane response plan • Traffic Safety Programs, ITS operational strategies, work zone safety programs, and traffic operational strategies • Development and implementation of safety improvement projects utilizing safety bond funds. Establishment of Mission Zero safety initiative for District. • Work with DPS, Texas Forest Service, and utilize CRIS system for safety project selection. • PDP-2012 • Project selection
Goal 3	<ul style="list-style-type: none"> • Measure pavement condition trends and plan effectiveness • TxTAP and radio and signals operations • Development and implementation of 4-year pavement management plan for each section within the district. Development and implementation of local process of selecting projects to be constructed throughout the District utilizing various funding mechanisms available. • Operations research and decision sciences • Work on 4-year pavement maintenance plan to maximize preventive maintenance work while minimizing major rehab work. • PDP-2012 • Shifting all available funds to pavement
Goal 4	<ul style="list-style-type: none"> • ITS operational strategies, managed lane strategies, 511 project and traffic operational strategies • Collaborative efforts with 2 local MPOs and other local elected leadership to identify major areas to consider for mobility type projects to relieve congestion. • Decision sciences • PDP-2012 • Extensive research to enhance its use
Goal 5	<ul style="list-style-type: none"> • ITS operational strategies, CVSN, BSIF, and traffic operational strategies • Evaluate system connectivity for as part of the project selection and prioritization process for all major projects. • Operations research and sciences • Work on development of Super 2 roadways throughout the district to improve efficiency on a limited budget. • PDP-2012 • Stakeholders involvement in statewide selection of projects
Goal 6	<ul style="list-style-type: none"> • Maximize all funding opportunities and effectively perform public outreach in all traffic operational and program areas (ITS earmarks, traffic safety grants, Safety Bond, and other safety earmarks) • Work with local MPOs and RMA on multimodal project needs as funding opportunities arise. • PDP-2012 • Funds to segments other than highways

When respondents were asked “*Do internal procedures exist to systematically evaluate methods to optimize your division’s/office’s performance?*” six responded “yes” and three responded “no.” If the respondent answered yes, they were asked to describe the procedures. All raw responses are listed below.

- PMIS, Safety records
- We develop manuals and procedures and reporting requirements that we then use to improve our programs.
- Many various performance measures/goals exist and are tracked through many various internal procedures. Example: Goal 1 - One DOT Staffing Plan with staffing level targets. Also Goal 1 - Performance measures within CRAFT that measure District's response time for resolutions to external issues. Goal 2 - District has initiated Safety Mission Zero and associated safety goals. Also is identifying safety projects and utilizing safety bond funds to improve public safety on roadways. Safety of facilities is tracked through Goal 3 - District has implemented 4-year pavement management plan with internal goals for each maintenance section and can be reviewed through internal accounting systems for productivity and efficiencies. Goal 4 - Method in place through working with MPO's and other elected officials to identify locations of high congestion and implement solutions through local contributions in addition to various TxDOT funding programs. Goal 5 - Mobility type project selections are made in which system connectivity is always considered as a major factor in the prioritization process. Goal 6 - District has assisted local MPOs in developing multimodal projects through our collaborative working relationships that have been developed.
- TxDOT Tracker has performance measures in place. Through the RLT information is shared relative to my district's performance.
- Internal in addition to mandated performance measures

Survey participants were asked who is responsible for operational efficiency or change within their division. Common responses included the district engineer, division directors, and themselves (all employees).

The final question of this section asked participants which units within TxDOT (any or all) have the highest influence on the achievement of the six strategic goals. The units listed for consideration were: (1) Finance, (2) Strategic policy and performance management, (3) Field and district operations, (4) Engineering operations, and (5) Support operations. The summary of the results are shown below.



In summary, respondents identified that there are several efforts currently being made in the management sciences and employees and units within TxDOT are actively moving towards meeting the six goals of the TxDOT strategic plan.

Opinions of Current State

The next section of questions in the survey consisted of prioritizing and identifying improvement areas within TxDOT.

The first question asked respondents what three issues relating to their operations would they have researched if given a highly competent analysis for six months. As open-ended questions, there were a variety of responses as shown below:

- Resource/Materials Management:
 - Surface selection for new pavements
 - 4-year pavement management plan utilization
- Project Effectiveness:
 - Accident reduction (effectiveness of applied solutions)
 - Level of service for snow and ice storms
 - Analyze additional avenues to quantify traffic safety behavioral modification efforts.
 - Is the district optimizing the use of ITS capabilities to manage congestion within the district?
 - Are we as focused on safety and preservation of the system as we should be?
 - Can our performance metrics be expanded to include other functional areas?
 - Internal performance measures and mandated performance measures
- Project Prioritization:
 - How best to establish program priorities
- Financial Allocations/Considerations:
 - Benefit/Cost ratio of expenditures
 - Comparison of in-house versus outsourced services
 - Total cost of owned equipment versus leased
 - Is our 4-year pavement management plan ensuring the greatest return on investment, or is it merely a spending plan to obligate available funding.
 - Budget
- Personnel Workload:
 - Analyze the reduction of technical staff in the districts that have traditionally supported traffic operations while the expectation of service level remains the same.
 - Determination of staffing/FTE levels within each Districts functional areas. (Strategies 101,105,604)
 - How best to determine needed staffing levels
 - How best to evaluate staff performance involved in programs
 - Is our OneDOT staffing plan doing enough to ensure that not only are we meeting the proper staffing goals, but that the numbers ensure we that the needed organizational structure.
 - Do we have the right number of FTE's in each of our operational areas?
- Future Planning:

- With financial constraints, evolving technology, and communication, a new direction for delivering of intelligent transportation systems needs to be strategically planned (TTI currently working on this).
- Future staff development needs (cross training)

The next question asked what three issues for TxDOT as a whole most deserve analytical research. Again, there were a variety of responses because it was an open-ended question, but the answers have been categorized below.

- Public Considerations:
 - Public involvement in projects
 - Accident reduction for various applications
 - How best to manage expectations
- Financial Efficiency:
 - Level of transportation funding required to maintain economic growth
 - Dollar amount of projects for advance planning through backlog of plans developed
 - Analyze financial processes and procedures
 - Future funding levels
 - What is the impact to the district's pavement management plans when administration changes project schedules and funding levels to accelerate projects in a rush to obligate funding without properly analyzing the return on investment?
 - Determine our effective costs for doing business in many functional areas, i.e. design, construction, maintenance, planning, operations, etc.
- Project Prioritization:
 - Project selection criteria
 - How best to establish priorities
 - Is the department properly distributing funding based on needs and priorities?
- Staffing:
 - FTE/Staffing levels and distribution
 - Future Staff development
 - A comprehensive staffing analysis is needed to better balance our FTE's with workload
- Internal Efficiency:
 - Improved performance measurements
 - Analyze the legacy systems within TxDOT that cannot provide needed information
 - Analyze solutions to the fact that TxDOT technology resources are well below that of private industry
 - What should the Department's role be in delivering projects

- Is the department properly using Regional Offices to provide the necessary support to the districts, or are they being used to monitor districts compliance with budgets, lettings, CRAFT issues, etc.
- A comprehensive risk analysis is needed to make sure we are managing our risks appropriately and not over-managing some risks.

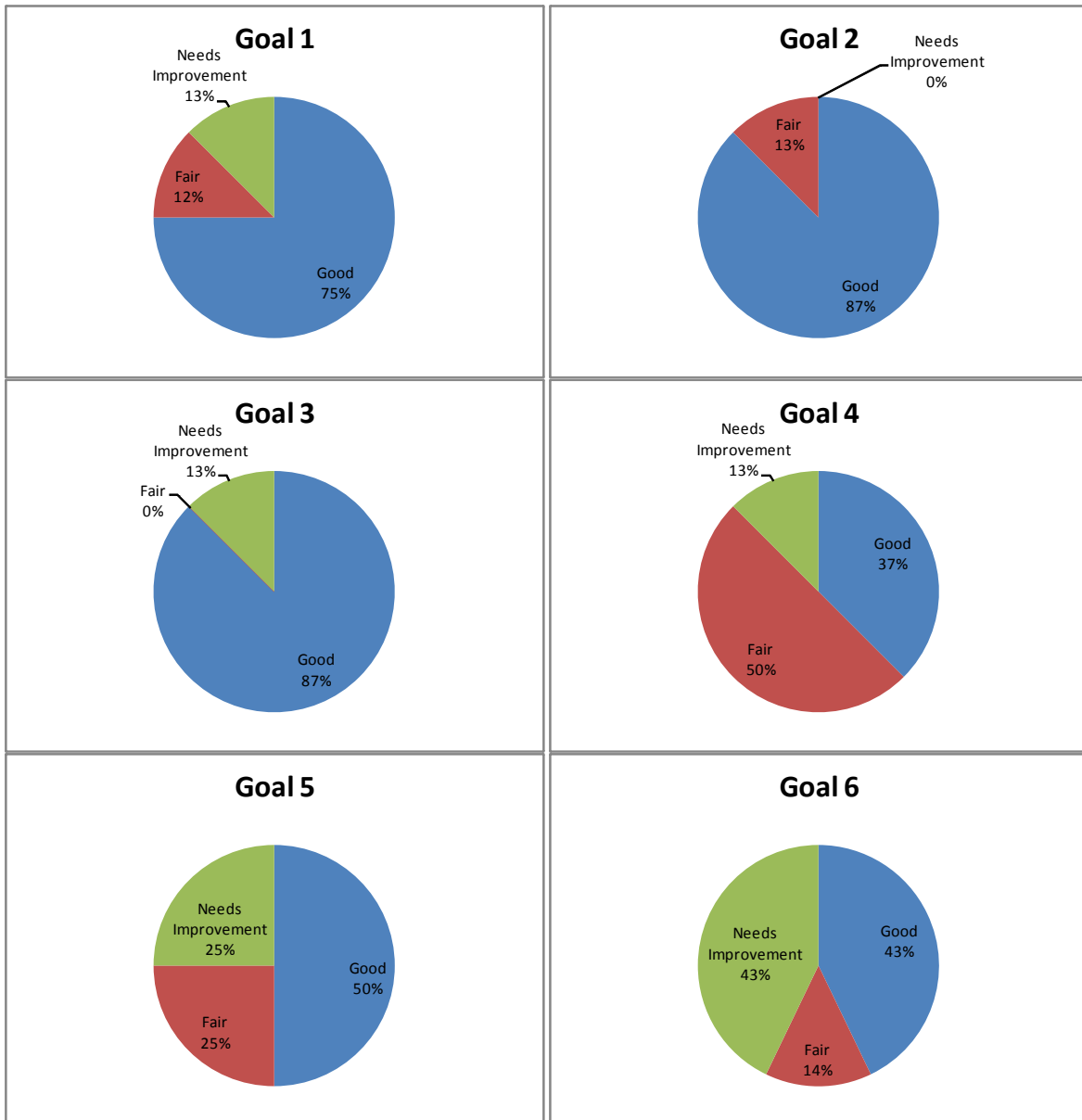
The next question refers to the issue that the respondent felt is generally under-appreciated.

- Cross Training Staff/Passing Knowledge Downstream:
 - Retention of institutional knowledge
 - Staff development. Not just formal training, but time and ability to develop younger/newer personnel on the job.
 - Succession Planning: while we have developed an organization that can quickly produce plans to obligate any additional funding that becomes available, we have not expended enough of an effort to properly develop and retain quality employees in an effort to encourage them to become future leaders of the department.
- Efficiency Amongst Limited Funding:
 - Realistic impacts on future system with significantly reduced funding
 - Provide for increasing traffic volumes with available funding that is remaining constant or decreasing.
 - Quantification of efficiencies and savings from negotiated professional services contracts
- Consistency Across All of TxDOT:
 - Standard operating procedures are established throughout the department but are not consistently followed in all districts and division.
 - Lack of sustainable approach to transportation system development
 - The need to establish priorities
 - The need for a required and disciplined approach to project management
 - The need for strong program oversight
 - The change in focus as related to the role of the Department in project delivery
 - The environmental process has become the critical path to project development. Our environmental organization and processes are in need for reinvention, retooling and re-prioritizing.

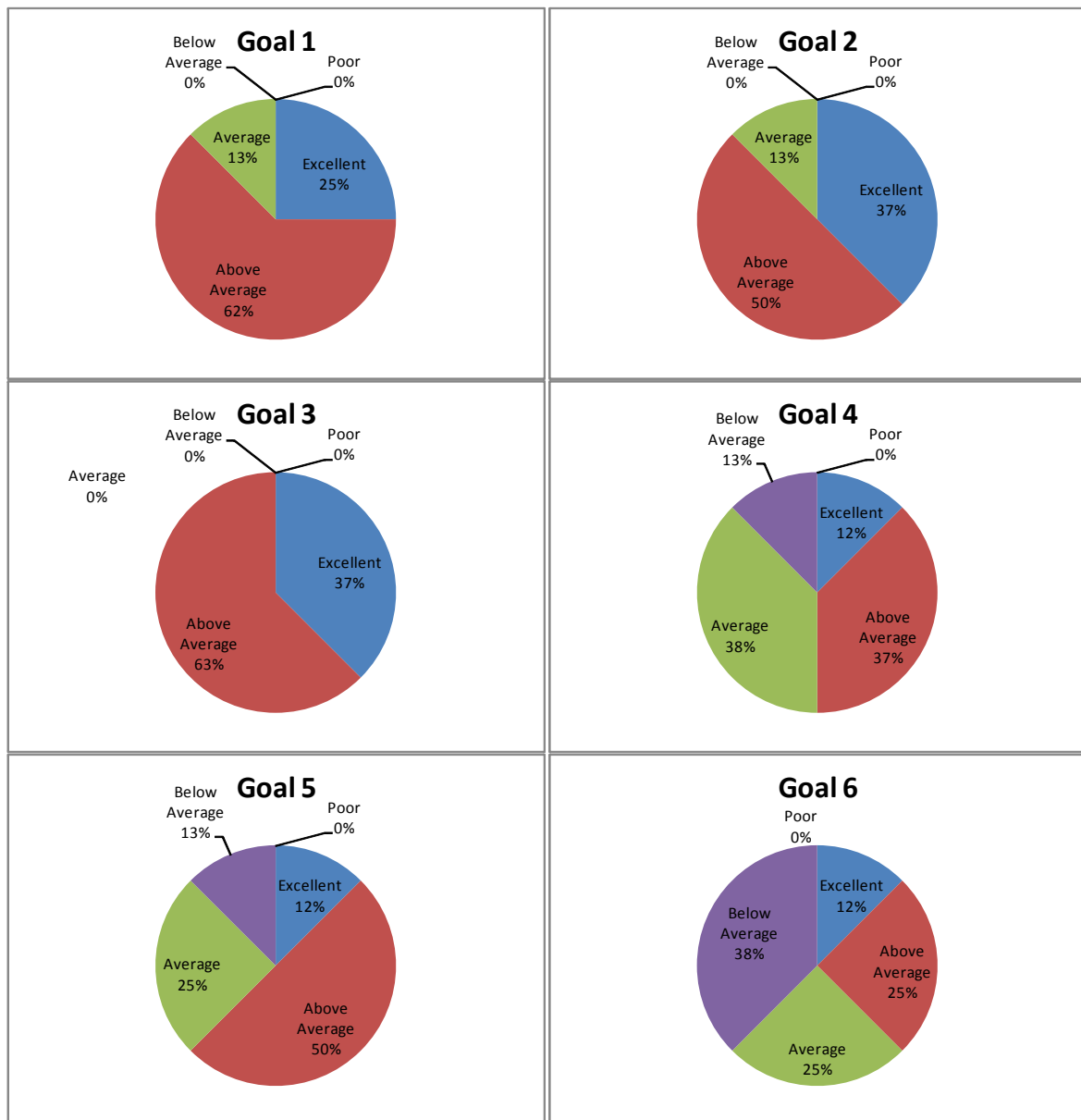
The next question asked participants what specific areas/programs within their division/office would gain the most from an improvement in efficiency. Responses included: automation, fleet maintenance, technology, maintenance field operations, and a comprehensive staffing analysis based on performance metrics. Project prioritization was again mentioned in detail by one respondent:

“The Mobility Project Selection - With our limited resources, the regional offices should step up and prioritize mobility improvement needs for the region, and then based on available funding let the regional DE's determine the project ranking. Then the mobility funding would be allocated based on the projects, in lieu of using formulas that many times do not provide sufficient funding to develop the necessary project to address the congestion issue.”

The next question asked respondents to rate the current work practices of their division/office in achieving each of the six TxDOT strategic goals. The charts below summarize the responses.



The next two questions relate to the financial efficiency of the participants' division/office and TxDOT as a whole. The first of these two questions rated the respondent's division's financial efficiency within the context of the six strategic goals. The second question asked how the participant would rate TxDOT's overall financial efficiency.



Of all respondents, 63% rated TxDOT's overall financial efficiency as "Good," 25% rated it "Fair," and 13% rated it as "Poor." When asked to explain why they provided such a rating, respondents said:

- Rated "Good":
 - Has seen significant improvement in recent years due to planning, sharing best practices and cost saving initiatives

- There are some processes that are limited by funding/purchasing restrictions and could be significantly improved.
- TxDOT has led the way with innovative financial partnerships in the U.S., but our antiquated financial system makes it difficult to answer all questions without significant manual labor.
- Optimum utilization of our funding resources that resulted in improved pavement scores when models predicted otherwise
- Rated “Fair”:
 - Lack of focus on priorities
- Rated “Poor”:
 - Pass-Thru-Toll Project was renegotiated after construction letting that realized a \$ 50 Million savings to TxDOT, after the original agreement was rushed.

The next question asked participants to rate TxDOT’s overall organizational efficiency (as opposed to financial efficiency). Of all respondents, 25% rated TxDOT’s overall organizational efficiency as “Excellent,” 38% rated it “Good,” and 38% rated it as “Fair.” When asked to explain why they provided such a rating, respondents said:

- Rated “Excellent”:
 - Every process is open to streamlining and improvements
 - Proven results
- Rated “Good”:
 - Has seen significant improvement in recent years due to planning, sharing best practices and cost saving initiatives
 - We are a great organization made up of excellent employees, but we seem to be out of balance with our priorities and risks
- Rated “Fair”:
 - Based on recent reports and audits related to the department's modernization efforts.
 - Lack of focus on priorities
 - TxDOT has right sized the number of employees, but has a big need to improve on placing the employees into the proper positions within the organizational structure. Just because we have the correct number of design personnel, does not mean that we have the proper design supervision and management levels.

The last question asked what part of the TxDOT organization needs to be improved the most in terms of efficiency and why. Open-ended responses consisted of:

- Automation: unresponsive to users and resists early adoption of improvements
- Turnpike
- Financial and technical areas: based on recent reports and audits related to the department's modernization efforts.

- Purchasing: The limitations of purchasing various things in order to achieve our goals are limited and restricted. Road materials are an example.
- Need to focus on sustainability and establishing priorities then being disciplined and expending money based on priorities
- In terms of efficiency, the part of TxDOT organization that most needs improvement is funding allocation and obligation scheduling. The administration seems to be in a constant rush to obligate any available funding, without taking the time to ensure that the funding is being used to provide the greatest return on investment, so districts are sometimes forced to let projects just to obligate the funds, even when those projects would not provide the greatest bang for the buck.
- All engineering divisions need to be combined into one Project Development Division to better manage the process, enhance communication and coordination and increase efficiency.
- HR hiring, firing, compensation, succession planning as it is a key to future development and success

In summary, respondents feel that TxDOT in general operates with above average efficiency, but there are several areas that could be improved upon. Recurring ideas consisted of improving the project prioritization process so that projects are funded based on need and are using TxDOT's financial resources in an effective and optimal way. Personnel cross-training was mentioned several times. With significant staff turnover and expertise within a job function, the need to pass along that knowledge is vital to the on-going success of the organization in the future. Job-sharing functions could be considered as part of employee training or exodus. Financial and material resource allocation should be carefully scrutinized to ensure appropriate projects and maintenance are being addressed across the state as a whole. Consistent and clear communication from a top-down chain of command is necessary to keep all employees moving forward towards the same strategic goals.

Recommendations

The last section of the survey focused on participants' recommendations as to what specific managerial solutions might be used to help the organization achieve its long-term goals. The first question asked for suggestions on efforts or programs the participant's division should conduct in the management sciences. The responses were given in general and then with respect to each of the six strategic goals.

In general, improving communication in a cost-effective way was one effort mentioned, especially since managers are located remotely from subordinate personnel. A desire for increased flexibility to make better business decisions was also mentioned. Improving the way in which staff within a division spend their time was addressed. A recurrent theme throughout the survey, project prioritization was brought up again in the context of developing a way to analyze the return on investment during the project selection process. More specifically, in order "to better evaluate that we are not only obligating the available funding, but that we are also using the funding to obtain the greatest return on our investment."

With respect to each of the six strategic goals:

Goal 1	<ul style="list-style-type: none"> • More flexibility with distribution of FTEs. • Most important • Better utilization of information systems to minimize internal meetings and travel time to allow greater time for communication and coordination with external partners and stakeholders. • Have a statewide succession plan; hiring to be centralized
Goal 2	<ul style="list-style-type: none"> • Develop a programmatic approach for the review of safety projects • Enhance the internal records documentation of collisions on the CRIS system to differentiate between collisions that are due to driver issues versus the need for pavement improvements. • Enhanced partnership with internal and external stakeholders
Goal 3	<ul style="list-style-type: none"> • Develop an asset management system • In addition to the Annual Pavement Condition Scoring and Reporting, provide information on how well the district performed on letting projects and completing work noted on their 4-Year PMP. • Improved performance measures that are relevant and useful
Goal 4	<ul style="list-style-type: none"> • Secure additional mobility funding • On mobility projects, require documentation showing how the project will impact the overall congestion index within the district, so that we are not building five overpasses through a town with one signal light.
Goal 5	<ul style="list-style-type: none"> • Enhance Macro-level approach to planning
Goal 6	<ul style="list-style-type: none"> • Develop a method for assessing based on sustainability criteria • Provide districts with greater flexibility on development of annual funding caps, in lieu of development of project letting schedule to match funding provided by division. • Training and communication to promote the multi-modal approach in the planning process

The next two questions asked what suggestions would the participant make to improve the financial performance of (1) their division/office and then (2) TxDOT as a whole.

Division/Office Suggestions:

- Better performance measurement
- We would ask the department to provide better financial resources, technologies and systems.
- Need to have accurate CSJs for charging to projects and need to have program charge numbers.

- In order to improve the financial performance of the district, I would suggest the development of an office of risk analysis which would calculate rates of return on project, analyze risk associated with accelerated letting of projects on project creep and delay due to incomplete ROW acquisition or utility adjustments. Further, in addition to the current Budget Information System, would add forecasting capabilities so that district's could provide projected monthly expenditures to enhance budget tracking.
- More flexible contracting and procurement policies that allow for and encourage innovation. We are very rigid with Comptroller and DIR requirements.
- Performance measures that are relevant and that rely on updated data

Overall suggestions for the organization:

- Place more emphasis on improving financial resources, technology and systems.
- More flexibility across all functional areas through revised policies that constrain making the best business decisions.
- Focus on total project cost. Develop priorities and focus limited money on priorities. Require a more disciplined approach of capturing staff time spent of projects (by project) and program work.
- As a part of the letting process, in addition to providing an anticipated construction schedule for the project, require districts to submit a payout schedule for the work being performed to better assist the finance division in projecting monthly expenditures.
- Better prediction and forecasting models for revenue and budgeting.

The next two questions related to TxDOT's expenditure categories and the resource allocations. The first question asked participants how they *guess* resources are currently allocated within each expenditure category, so that the total allocation totaled 100%. The second question first showed the actual current allocation percentages, and then asked participants how they *recommend* allocating resources within each category. All responses were averaged and are summarized in the table below.

	Planning	Building	Maintaining	Other Categories
Guess	13.6%	40.7%	37.9%	7.9%
Actual	19.1%	40.4%	35.5%	5.0%
Recommendation	20.0%	35.0%	40.0%	5.0%

The next question continued with the same expenditure categories and asked what amounts of financial resources should come for each category for the execution of each of the six strategic goals. The legend of choices was:

- **LOW:** I think a LOW amount of financial resources should come from this expenditure category for the execution of this goal

- MEDIUM: I think a MEDIUM amount of financial resources should come from this expenditure category for the execution of this goal
- HIGH: I think a HIGH amount of financial resources should come from this expenditure category for the execution of this goal

	Planning			Building			Maintaining			Other Categories		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Goal 1	29%	29%	43%	57%	14%	29%	43%	29%	29%	29%	29%	43%
Goal 2	14%	43%	43%	0%	29%	71%	0%	14%	86%	57%	14%	29%
Goal 3	14%	57%	29%	14%	43%	43%	0%	14%	86%	57%	29%	14%
Goal 4	14%	14%	71%	14%	14%	71%	57%	0%	43%	71%	14%	14%
Goal 5	14%	0%	86%	14%	29%	57%	43%	29%	29%	71%	29%	0%
Goal 6	29%	0%	71%	57%	14%	29%	57%	14%	29%	43%	43%	14%

The last question was similar in nature, but asked what specific units within TxDOT should be in charge of each of the six strategic goals. The choices for each unit were:

- LOW: I think this organizational unit should have LOW influence/control over the execution of this goal
- MEDIUM: I think this organizational unit should have MEDIUM influence/control over the execution of this goal
- HIGH: I think this organizational unit should have HIGH influence/control over the execution of this goal

	Finance			Strategic Policy and Performance Management			Field and District Operations			Engineering Operations			Support Operations		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Goal 1	29%	29%	43%	29%	29%	43%	14%	14%	71%	14%	57%	29%	14%	43%	43%
Goal 2	29%	57%	14%	57%	14%	29%	0%	14%	86%	14%	29%	57%	29%	57%	14%
Goal 3	29%	57%	14%	71%	0%	29%	0%	14%	86%	29%	14%	57%	43%	29%	29%
Goal 4	43%	29%	29%	43%	14%	43%	0%	29%	71%	14%	29%	57%	57%	43%	0%
Goal 5	43%	14%	43%	43%	29%	29%	0%	29%	71%	29%	14%	57%	71%	29%	0%
Goal 6	14%	57%	29%	71%	0%	29%	57%	29%	14%	43%	29%	29%	71%	29%	0%

In conclusion, the way in which TxDOT currently allocates financial resources should be checked for optimality. On average, respondents were fairly close in guessing how TxDOT currently allocates its funds, but their recommendations for financial allocation are different and should be considered. With regards to the six strategic goals, careful consideration should be made about how to achieve them. The four expenditure categories all play a part in achieving these goals, but are they properly proportioned? Similarly, where does the responsibility lie for achieving these goals within the organizational units of TxDOT? The previous two tables indicate the participant recommendations for these two questions, and should be taken into consideration.

Appendix C: Scoping Study Questionnaire for TxDOT Directors

Research Project 0-6637 Management Science Applications for TxDOT – Scoping Study

August 2011

Structured Interview Questions

1. If you were given a highly competent analyst for six months, what three issues or questions relating to your operations would you have them research/study?
2. Likewise, for the Department as a whole, what three issues/questions most deserve analytical research?
3. What specific areas within your division/office would gain the most from an improvement in operational efficiency?
4. What part of the TxDOT organization needs to be improved the most in terms of efficiency? Why?
5. What are some of the expenditures that you have observed TxDOT making that could be more optimally allocated?

Appendix D: Scoping Study Questionnaire for TxDOT Employees

Research Project 0-6637 Management Science Applications for TxDOT – Scoping Study

Structured Interview Questions August 2011

Name: _____

Title: _____

Office: _____

1. What three issues or questions relating to your area must need (more) analytical research?
2. Likewise, for the Department as a whole, what three issues/questions most deserve analytical research?
3. What specific areas within your division/office would gain the most from an improvement in operational efficiency?
4. What part of the TxDOT organization at large needs to be improved the most in terms of efficiency? Why?
5. What are some of the expenditures that TxDOT is making that could be more optimally allocated?
6. Anything else you would suggest to improve your own and/or TxDOT's performance?



Appendix E: Case Study – Research Problem Statement

Form ProbStat
(Rev. 2/2009)
(RTI)

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 implementability, cost and operational benefit.</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> <p>What specific deliverables would help TxDOT implement the findings / results from this project? 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? Technology Services.</p>				
Developed By:	0-6337 Research Group				

