NDOT Research Report

Report No. 031-14-803

Developing a Strategic Plan for Nevada DOT to Implement Innovation through Research and Development

November 2014

Nevada Department of Transportation
1263 South Stewart Street
Carson City, NV 89712

NEVADA DOT
SAFE AND CONNECTED

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FINAL REPORT

Developing a Strategic Plan for NEVADA DOT to Implement Innovation through Research and Development

NEVADA DOT

November 2014

Prepared for:
Nevada Department of Transportation

Kimley»Horn

DEVELOPING A STRATEGIC PLAN FOR NEVADA DOT TO IMPLEMENT INNOVATION THROUGH RESEARCH AND DEVELOPMENT

FINAL REPORT

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DOT	Department of Transportation
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
NDOT	Nevada Department of Transportation
RITA	Research and Innovative Technology Administration

1. INTRODUCTION

The following sections provide an introduction into the project background, project overview, and plan organization for the Developing a Strategic Plan for the Nevada Department of Transportation (NDOT) to Implement Innovation through Research and Development (Strategic Research Plan) project.

1.1. Project Background

NDOT is developing a Strategic Research Plan to set the future priorities of research projects and to communicate those priorities internally and externally. The Strategic Research Plan is anticipated to greatly benefit external stakeholders in effectively addressing and communicating NDOT's research priorities.

1.1.1. Vision

It is NDOT's vision that the Strategic Research Plan will cultivate opportunities for collaboration on research with new and existing partners, and target existing NDOT resources to provide the greatest benefit for the State transportation system and its users.

1.1.2. Purpose

The primary purpose of this project is to develop a Ten-Year Strategic Research Plan for NDOT that can be leveraged to implement the needed innovation through research and development processes and methods. In addition, the purpose of this project is to develop priorities for future NDOT research projects and to communicate those priorities internally and externally. It is also the purpose of the Strategic Research Plan to provide a framework for NDOT's internal stakeholders and its partners to collaborate and ensure research resources are directed to the most crucial needs of NDOT. The Strategic Research Plan will act as a compass to ensure selected research projects are aligned with NDOT's strategic goals as well as current priorities.

1.1.3. Project Need

Internally, there is a need to help guide research that is proposed and selected by NDOT's Research Advisory and Research Management Committees. There is also a need to communicate NDOT's research priorities externally in order to find partners with matching research interests, reduce duplication of effort, and potentially influence the broader transportation research landscape. In addition, the Strategic Research Plan is needed to help NDOT create synergy of research efforts that extend beyond narrowly defined programs.

1.2. Project Overview

This project includes three primary task assignments. The following is a brief description of the tasks associated with this project. A more detailed description of each task can be found in subsequent sections of this document.

1.2.1. Synthesis of National Research Initiatives

A technical memorandum was prepared to summarize the major national research initiatives and research priorities set forth by four federal transportation agencies: U.S. Department of Transportation (DOT) and Research and Innovative Technology Administration (RITA), Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and Federal Railroad Administration (FRA). Two State Department of Transportation's Strategic Research Plans were also summarized which were California

and Texas. Key aspects are summarized in the technical memorandum including the plan development methodologies, plan components, and key research areas.

1.2.2. Strategic Innovation Plan Development Workshops

A kick-off workshop was held to introduce key stakeholders to the project and to discuss the critical factors for success of the project. Three additional workshops with similar formats were held to inform all stakeholders of the project purpose, introduce background information, provide an overview of national research initiatives, and discuss key research areas. These workshops were facilitated to allow stakeholders the opportunity to discuss NDOT's Strategic Goals and develop potential research questions that align with NDOT's Strategic Goals. The results of the workshops were summarized and grouped into research areas. An online survey was used for stakeholder to prioritize and rank the different research areas.

1.2.3. Developing the Ten-Year Strategic Research Plan

After completion of the stakeholder workshops and obtaining feedback through the online survey, a draft Strategic Research Plan was provided to NDOT and stakeholders for review and comment. This plan is designed to provide guidance on priority research areas for NDOT based on stakeholder input. The resulting priority research areas have been provided to guide NDOT's research program efforts for a ten-year period, but should be reviewed periodically to insure it remains relevant and applicable to the current needs and priorities of NDOT. Comments obtained from the draft Strategic Research Plan were incorporated into this final Strategic Research Plan.

1.3. Strategic Research Plan Organization

The Strategic Research Plan is organized into the following sections: introduction, methodology, strategic goal and research area prioritization, performance measures, how to use this document, and summary. Appendices are found at the end of the plan.

- **Section 1** presents the project background and overview information. This includes statements on the project vision, purpose, and need.
- **Section 2** describes the methodology used in accomplishing the different primary task associated with this project.
- **Section 3** prioritizes NDOT's Strategic Goals along with the developed research areas using the results of the online survey and a matrix that maps the "usefulness" and "urgency" of research areas.
- **Section 4** is a general discussion on the use of performance measures in research and for this Strategic Research Plan.
- **Section 5** is a brief explanation on how this document should be used.
- **Section 6** provides a summary and conclusion to the project and the overall Strategic Research Plan.
- **Appendices**

2. METHODOLOGY

The following section describes the methodology used in accomplishing the different primary tasks associated with this project. These tasks include the synthesis of national research initiatives, stakeholder workshops, the development of research areas, and the online survey.

2.1. Synthesis of National Research Initiatives

A technical memorandum was prepared to summarize the major national research initiatives and other research priorities set forth by several federal and state agencies. Research was performed on existing Strategic Research Plans from the U.S. DOT and RITA, FHWA, FTA, FRA, and from the states of California and Texas. Key aspects from each of the plans researched were summarized to aid NDOT in the development of this Strategic Research Plan. Each plan has strengths that were used to help in the development of NDOT's Strategic Research Plan. For each of the reviewed Strategic Research Plans, a summary of the key research areas and components are found in **Table 1** and **Table 2** respectively. The complete technical memorandum can be obtained from NDOT's Research Department.

Table 1 – Key Research Areas

Key Research Areas	U.S. DOT	FHWA*	FTA	FRA	Caltrans	TxDOT
Safety	✓		✓	✓	✓	
Infrastructure	✓		✓	✓	✓	✓
Cost	✓		✓	✓		
Movements of Goods	✓					
Environmental/Stewardship	✓		✓	✓	✓	✓
Leadership in Research			✓			
Transit Ridership			✓			
Efficiency			✓			
Energy Independence			✓			
Livable Communities				✓		
Workforce Development				✓	✓	✓
Mobility					✓	
Project Delivery					✓	
Demand						✓
Network						✓

**For the FHWA Strategic Research Plan there are no key research areas defined.*

Table 2 – Strategic Research Plans Component Overview

Component	U.S. DOT	FHWA	FTA	FRA	Caltrans	TxDOT
Modeled After Parent Agency's Strategic Plan	✓		✓	✓	✓	
Vision			✓			
Mission			✓	✓		
Goals/Priorities	✓		✓	✓	✓	
Objectives			✓			
Strategies			✓	✓		
Research Questions					✓	
Strategic Outcomes	✓					
Priority Areas	✓					
Performance Measures	✓					
Guiding Principles		✓				
Agency Commitments		✓				
Topic Identification						✓
Topic Selection						✓

2.2. Stakeholder Workshops

A kick-off workshop was held to introduce key stakeholders to the project and to discuss the critical factors for success of the project. Some of the critical factors of project success discussed in the workshop include knowledge of relevant national research information, alignment with NDOT's Strategic Goals, and a need for performance measures. The schedule of the project was also reviewed along with the timeline on the project deliverables.

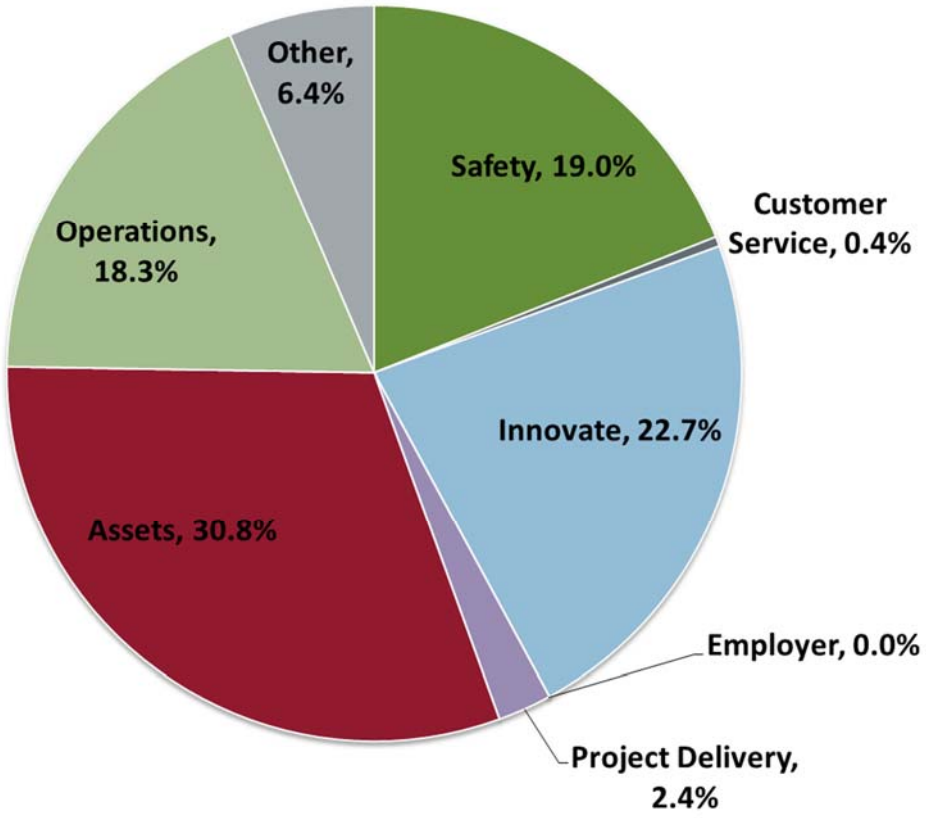
Three workshops with similar formats were held to inform all stakeholders about the project purpose and background, scope of work, Synthesis of National Research, and NDOT's Strategic Goals. Stakeholders included NDOT employees from various departments, NDOT research champions, university researchers, local Metropolitan Planning Organization representatives, local city and county representatives, and FHWA representatives. A complete list of workshop attendees can be found in **Appendix A**. Each of the workshops was held in one location and broadcast through videoconference between each of the three District offices and Headquarters. The workshops were held on the following days:

- Tuesday, June 10, 2014, from 10:30 PM – 12:00 PM (Kick-Off)
- Tuesday, August 19, 2014, from 1:30 PM – 3:30 PM

- Monday, August 25, 2014, from 1:30 PM – 3:30 PM
- Tuesday, September 2, 2014, from 9:30 AM – 11:30 AM

The workshops were designed to allow stakeholders the opportunity to review NDOT's Strategic Goals and develop potential research questions that align with those strategic goals. NDOT provided funding information for research projects from July 31, 2007 to May 5, 2014. During the workshops, an overview of how NDOT has used this research funding in relationship with each of the strategic goals was presented to the attendees. **Figure 1** illustrates the percent of research dollars spent on each of the strategic goals since July 31, 2007. NDOT's Strategic Goals are listed below:

- Optimize safety (Safety – 19.0%)
- Be in touch with and responsive to customers (Customer Service – 0.4%)
- Innovate (Innovate – 22.7%)
- Be the employer of choice (Employer – 0.0%)
- Deliver timely and beneficial projects and programs (Project Delivery – 2.4%)
- Effectively preserve and manage our assets (Assets – 30.8%)
- Effectively operate the transportation system (Operations – 18.3%)



Percentage of Research Dollars Spent by NDOT Strategic Goal since July 31, 2007

Figure 1 – Research Dollars Spent by NDOT Strategic Goal

After an overview of NDOT's Strategic Goals was provided the stakeholders broke into small groups for discussion. The purpose of these groups was to brainstorm potential research questions related to each of NDOT's Strategic Goals that could be addressed by research projects. Following the group brainstorming session, a representative from each group shared their top research questions for each strategic goal with the entire group. This allowed the other groups the chance to hear additional research questions with the hope that it would stimulate thought and the creation of additional research questions. At the end of the workshop, the worksheets with all of the research questions and ideas were collected.

2.3. Development of Research Areas

The research questions from the three workshops were compiled into a comprehensive list based on the associated strategic goal and then grouped into research areas. Research areas were determined by grouping questions with similar areas of emphasis to shows what potential research areas exist within each of NDOT's Strategic Goals based on stakeholder input. The following subsections show each of the strategic goals and its developed research areas along with a few example research questions. The complete consolidated listing of NDOT's Strategic Goals, research areas, and associated research questions that were developed in the workshops is located in **Appendix B**.

2.3.1. Optimize Safety

The research questions related to the "optimize safety" strategic goal were used to develop six research areas. Each of the research areas is abbreviated with a capital S followed by a number. Below are the "optimize safety" research areas along with a few example research questions:

- Safety Technology (S1)
  - How to utilize the latest technological developments to improve existing safety practices in Nevada?
- Employee Safety (S2)
  - How do we improve worker and public safety in work zones?
- Road User Safety (S3)
  - How to enable the implementation of the Highway Safety Manual?
- Safety Effectiveness (S4)
  - What demographic groups in Nevada are not receiving safety messages and how do we best reach these groups?
- Crash Data/Info (S5)
  - How can we leverage existing crash data to develop systemic improvements on our roadways?
- Safety Education and Training (S6)
  - How can we educate drivers on traffic technologies?

2.3.2. Be in Touch and Responsive to Customers

The research questions related to the "be in touch and responsive to customers" strategic goal were used to develop two research areas. Each of the research areas is abbreviated with a capital C followed by a number. Below are the "be in touch and responsive to customers" research areas along with a few example research questions:

- Involvement with Other Agencies (C1)
  - How can we make it easier for outside agencies to work with NDOT?
- Involvement with the General Public (C2)

- How can we better understand the public's perceived issues and knowledge of the roadways system?

2.3.3. Innovation

The research questions related to the "innovation" strategic goal were used to develop five research areas. Each of the research areas is abbreviated with a capital I followed by a number. Below are the "innovation" research areas along with a few example research questions:

- Technology (I1)
  - How can GIS technologies be used to improved operations within NDOT?
- Planning and Operations (I2)
  - What innovative strategies are most effective in reducing travel demand by enhancing choices?
- Materials and Assets (I3)
  - How to achieve timely and efficient inspection of infrastructures such as bridges?
- Funding and Economics (I4)
  - Are economic development factors being taken into consideration and how should they be used in project prioritization?
- Organizational and Internal Processes (I5)
  - How can the DOT better insure consistency between the districts and Headquarters?

2.3.4. Be the Employer of Choice

The research questions related to the "be the employer of choice" strategic goal were used to develop five research areas. Each of the research areas is abbreviated with a capital E followed by a number. Below are the "be the employer of choice" research areas along with a few example research questions:

- Employee Retention (E1)
  - How is retention related to being competitive with other public agencies?
- Hiring (E2)
  - How do we attract and recruit qualified staff for our positions?
- Employee Training (E3)
  - What kind of training should be provided to NDOT employees?
- Compensation Package (E4)
  - What is a competitive compensation policy for similar government/private positions and how does NDOT become competitive?
- Work Environment (E5)
  - What are the most effective ways to improve communication between NDOT management and employees?

2.3.5. Deliver Timely and Beneficial Projects and Programs

The research questions related to the "deliver timely and beneficial projects and programs" strategic goal were used to develop four research areas. Each of the research areas is abbreviated with a capital P followed by a number. Below are the "deliver timely and beneficial projects and programs" research areas along with a few example research questions:

- Project/Program Prioritization and Selection (P1)

  - How can we effectively select projects based on a regional and statewide level analysis?
- Project/Program Evaluation and Effectiveness (P2)
  - How do we follow-up with stakeholders to determine if the goals of the project were met?
- Project/Program Cost and Benefit (P3)
  - What is the most cost effective process for projects: in-house or contractor/consultant?
- Program/Program Data (P4)
  - How can cost and schedule data of construction projects be used to develop effective strategies for delivering timely and beneficial projects and programs?

2.3.6. Effectively Preserve and Manage Our Assets

The research questions related to the "effectively preserve and manage our assets" strategic goal were used to develop three research areas. Each of the research areas is abbreviated with a capital A followed by a number. Below are the "effectively preserve and manage our assets" research areas along with a few example research questions:

- Asset Management (A1)
  - How do we better manage our assets through life-cycle evaluations?
- Asset Preservation (A2)
  - How to optimize repair and rehabilitation strategies of assets?
- Cost and Funding (A3)
  - How much does it actually cost to maintain our assets?

2.3.7. Effectively Operate the Transportation System

The research questions related to the "effectively operate the transportation system" strategic goal were used to develop four research areas. Each of the research areas is abbreviated with a capital O followed by a number. Below are the "effectively operate the transportation system" research areas along with a few example research questions:

- Data Management (O1)
  - How can we improve/enhance data collection, synthesis, and use across modes?
- Maintenance and Operations (O2)
  - What resources do we need to effectively operate the transportation system and how do we get those resources properly allocated?
- Integration of all Modes of Transportation (O3)
  - Do roadways work better with BRT in place?
- System Optimization (O4)
  - What methods/innovation can be used to optimize movement during the construction/repair of a roadway?

2.3.8. Summary

Each of the NDOT's Strategic Goals with its associated research areas are summarized in **Table 3**.

Table 3 – Summary of Research Areas

NDOT Strategic Goal	Research Area
Optimize safety (S)	Safety Technology (S1)
	Employee Safety (S2)
	Road User Safety (S3)
	Safety Effectiveness (S4)
	Crash Data/Info (S5)
	Safety Education and Training (S6)
Be in touch with and responsive to customers (C)	Involvement with Other Agencies (C1)
	Involvement with the General Public (C2)
Innovate (I)	Technology (I1)
	Planning and Operations (I2)
	Materials and Assets (I3)
	Funding and Economics (I4)
	Organizational and Internal Processes (I5)
Be the employer of choice (E)	Employee Retention (E1)
	Hiring (E2)
	Employee Training (E3)
	Compensation Package (E4)
	Work Environment (E5)
Deliver timely and beneficial projects and programs (P)	Project/Program Prioritization and Selection (P1)
	Project/Program Evaluation and Effectiveness (P2)
	Project/Program Cost and Benefit (P3)
	Project/Program Data (P4)
Effectively preserve and manage our assets (A)	Asset Management (A1)
	Asset Preservation (A2)
	Cost and Funding (A3)
Effectively operate the transportation system (O)	Data Management (O1)
	Maintenance and Operation (O2)
	Integration of all Modes of Transportation (O3)
	System Optimization (O4)

A complete list of the developed research areas with associated research questions from the three workshops can be found in **Appendix B**.

2.4. Survey

Following the workshops and the development of research areas, an online survey was sent out to all stakeholders to allow them to provide input toward the different areas discussed at the workshops. The survey was used to rank NDOT's seven Strategic Goals and the developed research areas within each of those goals. Each research area was individually ranked on the usefulness of the research in that area and the urgency to perform research in that area. Next, each responded was asked to choose what should be NDOT's top five priority research areas. Lastly, the survey asked about whether or not the Strategic Research Plan should include performance measures and respondents were asked to rank the quality of some predetermined performance measures. The survey also included spots for the respondents to submit additional research questions and performance measures. The additional research questions received from the survey were added to the complete list of questions found in **Appendix B**. A copy of the online survey can be found in **Appendix C**.

There were 36 of the 96 total stakeholders who completed the online survey. Of those 36 respondents, 26 were NDOT employees, four worked at other public agencies, and six worked at universities. The survey had a total of 28 questions, and the complete list of questions and results from the survey can be found in **Appendix D**.

3. STRATEGIC GOAL AND RESEARCH AREA PRIORITIZATION

The following section provides the ranking and prioritizations of NDOT's Strategic Goals and their associated research areas. The ranking of both the strategic goals and research areas was completed using the results of the online survey and the creation of a matrix that maps the "usefulness" and "urgency" of research areas. The top priority research areas are those areas with a high score of "usefulness" and "urgency" and should be given the greatest consideration when selecting future research projects.

3.1. Ranking of the Strategic Goals

As part of the survey each of the respondents was asked to rank NDOT's Strategic Goals in order of priority based on research needs. The "optimize safety" strategic goal was the top priority ranking receiving 19 of the 36 number one priority votes while the "be the employer of choice" strategic goal was the bottom priority ranking receiving 21 of the 36 number seven priority votes. The average ranking score was determined for each of the strategic goals. Following is the strategic goals listed in order of priority based on the survey responses with their ranking score:

- Optimize safety – 5.69
- Effectively operate the transportation system – 4.28
- Effectively preserve and manage our assets – 4.11
- Deliver timely and beneficial projects and programs – 3.94
- Innovation – 3.69
- Be in touch with and responsive to customers – 3.64
- Be the employer of choice – 2.64

3.2. Ranking of Research Areas

The stakeholders also ranked each of the research areas within each of the individual strategic goals. This was performed in an effort to see what would be the top research areas for each of the strategic goals. **Table 4** shows the ranked research areas for each of NDOT's Strategic Goals.

Table 4 – Summary of Ranked Research Areas

NDOT Strategic Goal	Ranked Research Area
Optimize safety (S)	1. Road User Safety (S3)
	2. Employee Safety (S2)
	3. Safety Technology (S1)
	4. Safety Effectiveness (S4)
	5. Safety Education and Training (S6)
	6. Crash Data/Info (S5)
Effectively operate the transportation system (O)	1. Maintenance and Operation (O2)
	2. System Optimization (O4)
	3. Data Management (O1)
	4. Integration of all Modes of Transportation (O3)
Effectively preserve and manage our assets (A)	1. Asset Management (A1)
	2. Asset Preservation (A2)
	3. Cost and Funding (A3)
Deliver timely and beneficial projects and programs (P)	1. Project/Program Prioritization and Selection (P1)
	2. Project/Program Evaluation and Effectiveness (P2)
	3. Project/Program Cost and Benefit (P3)
	4. Project/Program Data (P4)
Innovate (I)	1. Technology (I1)
	2. Planning and Operations (I2)
	3. Materials and Assets (I3) - Tie
	3. Funding and Economics (I4) - Tie
	5. Organizational and Internal Processes (I5)
Be in touch with and responsive to customers (C)	1. Involvement with Other Agencies (C1) - Tie
	1. Involvement with the General Public (C2) - Tie
Be the employer of choice (E)	1. Employee Retention (E1)
	2. Compensation Package (E4)
	3. Hiring (E2)
	4. Work Environment (E5)
	5. Employee Training (E3)

Next, the stakeholders were asked to select what research areas should be considered NDOT's top five priorities from the complete list of total research areas from every strategic goal. From this ranking six research areas were selected because there were three research areas that received fourteen votes and

three other research areas that received nine votes. The following list shows the top six priority research areas according to stakeholder input:

- Road User Safety (S3) – 14 votes
- Project/Program Prioritization and Selection (P1) – 14 votes
- Asset Preservation (A2) – 14 votes
- Employee Safety (S2) – 9 votes
- Technology (I1) – 9 votes
- Maintenance and Operations (O2) – 9 votes

3.3. Usefulness-Urgency Matrix

A usefulness-urgency matrix is a tool that was used to prioritize research areas. All research areas were graphed on the matrix based on the usefulness score and the urgency score received from the online survey. On the usefulness-urgency matrix, usefulness relates to the importance or relevance of the research area in term of reaching NDOT's Strategic Goals. The usefulness value range is defined as follows:

- Low (bottom half of graph): Survey respondents ranked these research areas with less importance or relevance in helping NDOT reach its strategic goals.
- High (top half of graph): Survey respondents ranked these research areas with more importance or relevance in helping NDOT reach its strategic goals.

On the usefulness-urgency matrix, urgency relates to how critical or imperative it is that the research need is addressed immediately. The urgency value range is defined as follows:

- Low (left half of graph): Survey respondents ranked these research areas with a relatively low need to be addressed immediately. According to survey responses, these research areas have no immediate critical or imperative needs to be addressed.
- High (right half of graph): Survey respondents ranked these research areas with a relatively high need to be addressed immediately. According to survey responses, these research areas have immediate critical or imperative needs to be addressed.

In general, the "**P-I-C-K**" rule of thumb should be considered when selecting priority research areas for future research projects:

- **P** – Proceed: High Usefulness, High Urgency (High Priority Research Areas) – These research areas are generally recommended as high priority when selecting future NDOT research projects and are in line with the most critical needs.
- **I** – Investigate: High Usefulness, Low Urgency (Medium Priority Research Areas) – These research areas are generally recommended as medium priority because of their high usefulness score they will help NDOT reach its strategic goals, but have no pressing need at the moment.
- **C** – Consider: Low Usefulness, High Urgency (Medium Priority Research Areas) – These research areas are generally recommended as medium priorities because of the high urgency score to meet an immediate need, but tend not to lead towards fulfilling a strategic goal
- **K** – Keep for Reference: Low Usefulness, Low Urgency (Low Priority Research Areas) – These research areas are generally recommended as low priority because of their low usefulness and low urgency scores.

Figure 2 illustrates the usefulness-urgency matrix scoring theory.

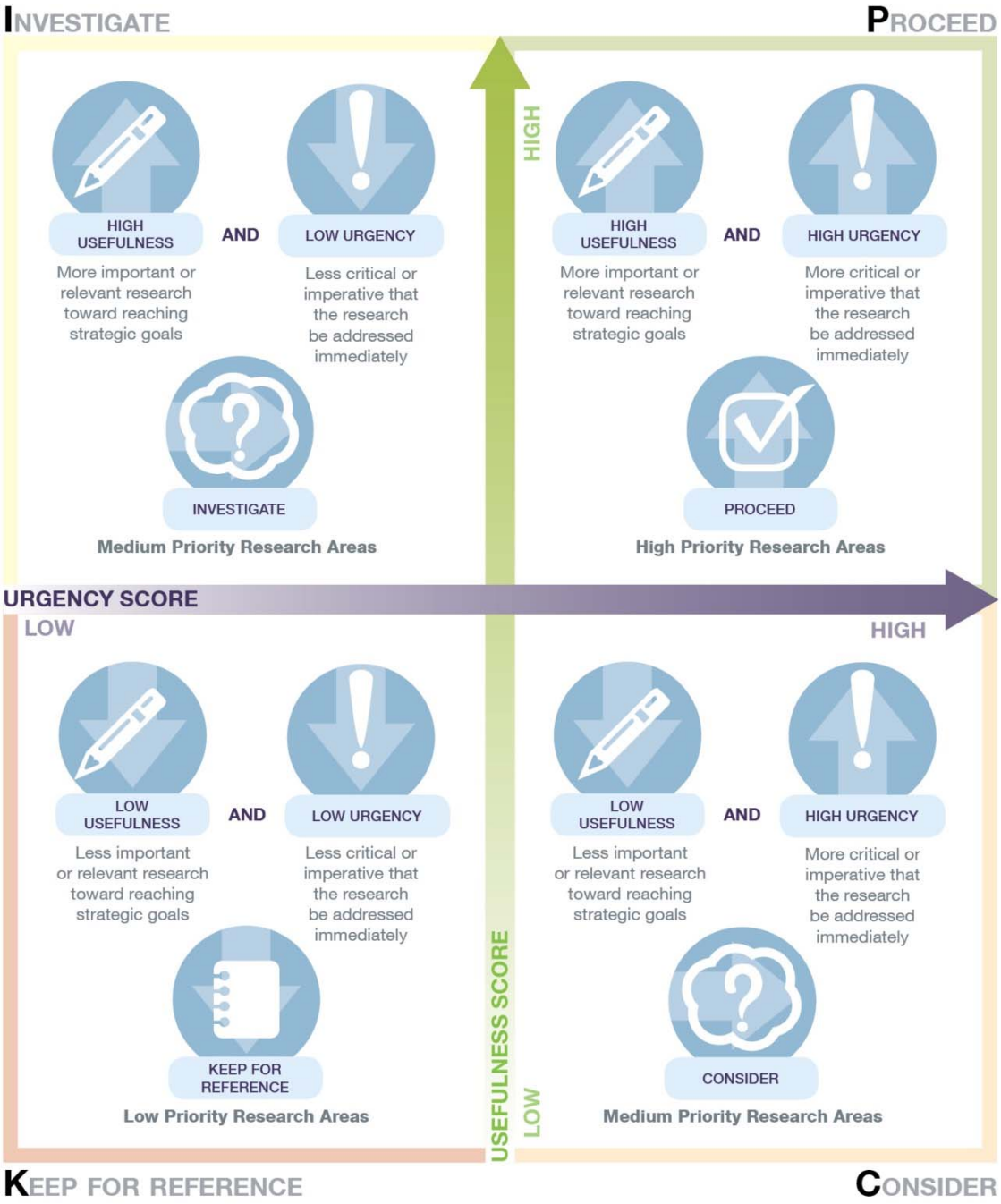


Figure 2 – Usefulness-Urgency Matrix Scoring Theory

3.4. Summary of Usefulness-Urgency Matrix Results

The different research areas were graphed on the usefulness-urgency matrix with respect their individual usefulness and urgency scores as seen in **Figure 3**. Based on the results, the following nine research areas fell within the "Proceed" quadrant of the matrix:

- Road User Safety (S3)
- Safety Effectiveness (S4)
- Technology (I1)
- Employee Retention (E1)
- Project/Program Prioritization and Selection (P1)
- Project/Program Evaluation and Effectiveness (P2)
- Asset Management (A1)
- Asset Preservation (A2)
- Maintenance and Operations(O2)

Research areas within the "Proceed" quadrant are considered as high priority research areas (high usefulness and high urgency), research areas within the "Investigate" and "Consider" quadrants are considered as medium priority research areas, and research areas within the "Keep for Reference" quadrant are considered as low priority research areas (low usefulness and low urgency).

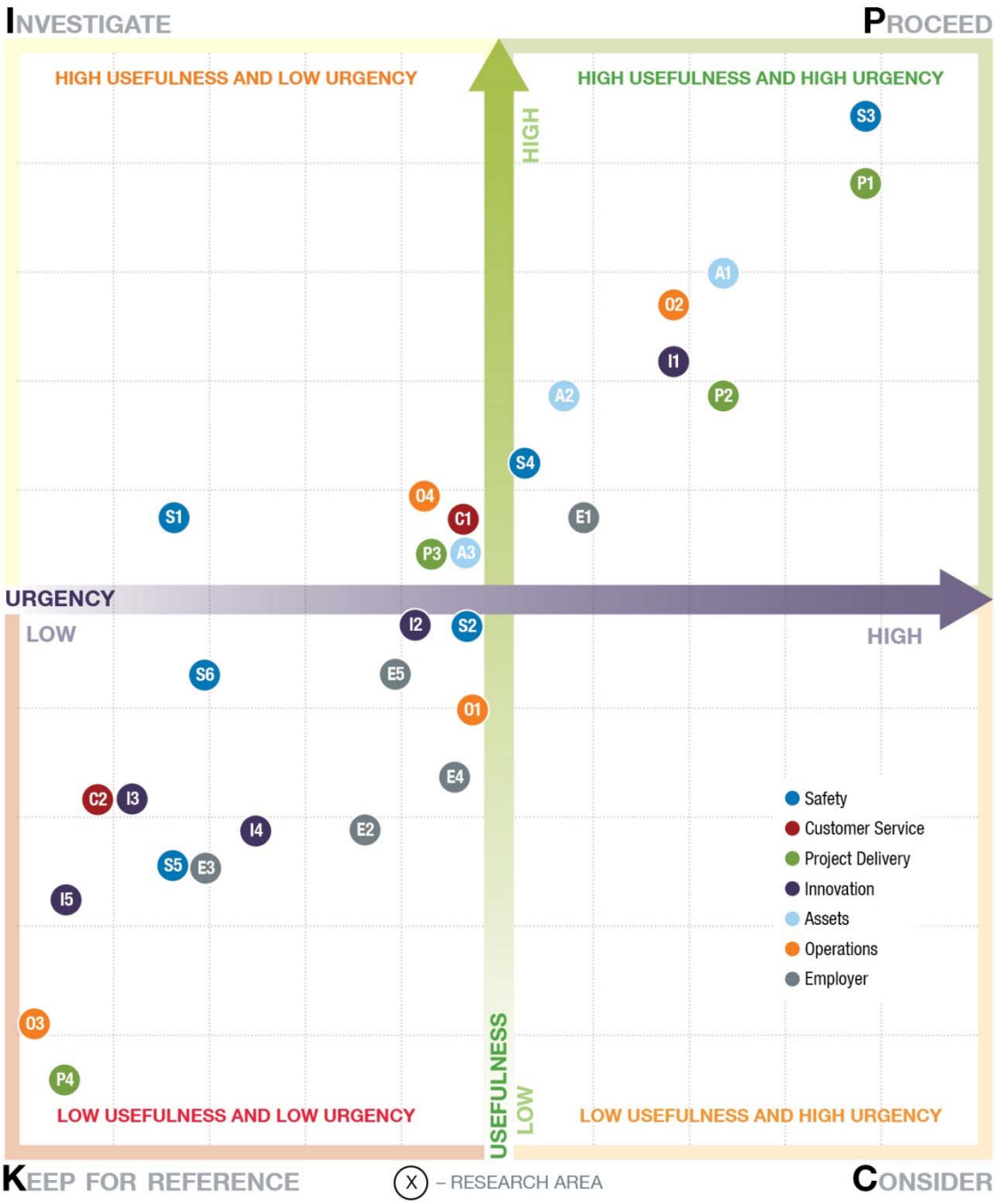


Figure 3 – Usefulness-Urgency Matrix

Next, the research areas for each of the individual strategic goals were graphed on separate usefulness-urgency matrix as seen in **Figure 4** through **Figure 10**. On each of these matrices the ranking of the research areas, as found in section 3.2, is shown using varied symbol sizes. An example of this is found

in the safety usefulness-urgency matrix where research area S3 has the largest symbol because it was the top ranked research area within the “optimize safety” strategic goal while S5 has the smallest symbol because it was the bottom ranked research area.

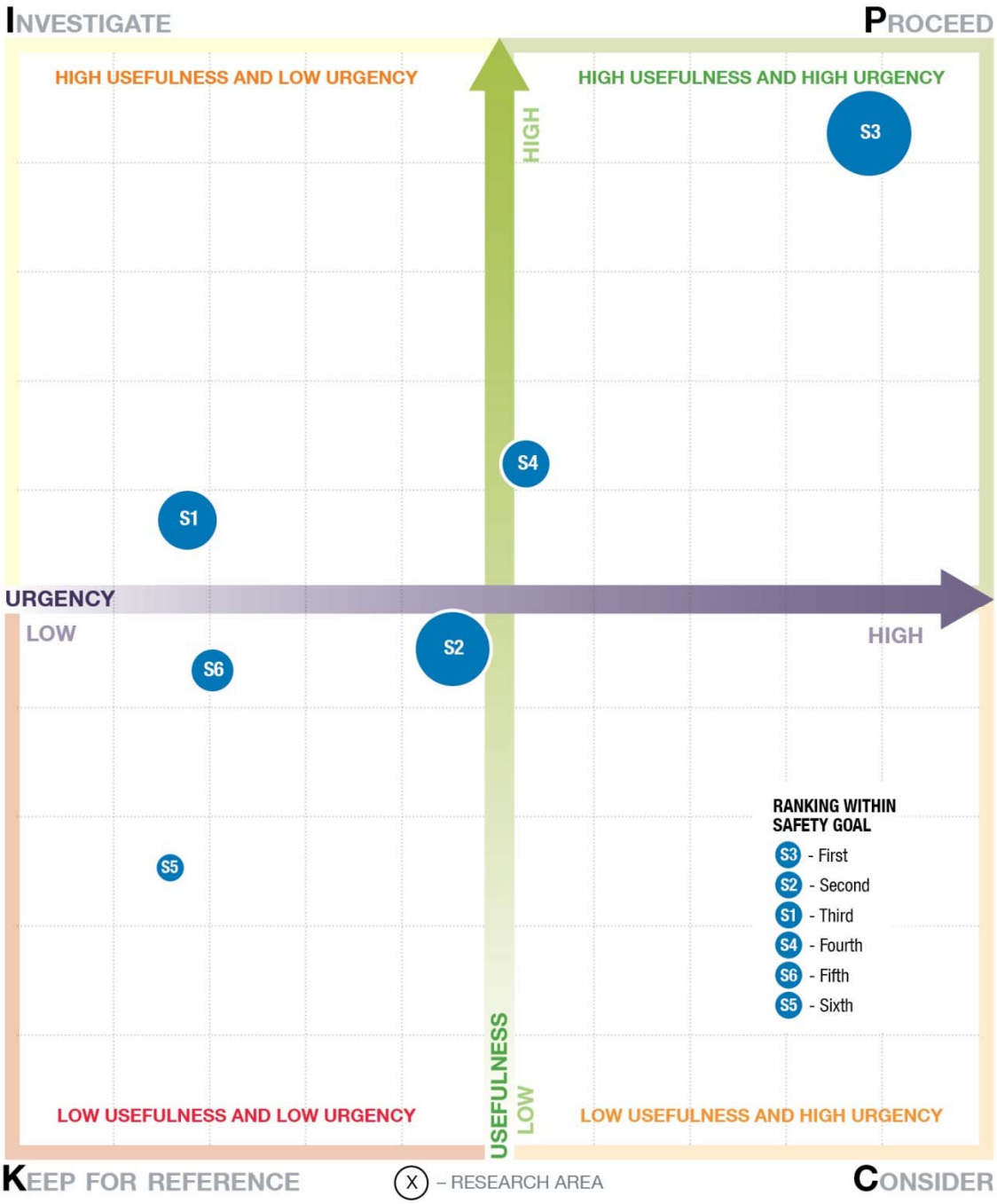


Figure 4 – Safety Usefulness-Urgency Matrix

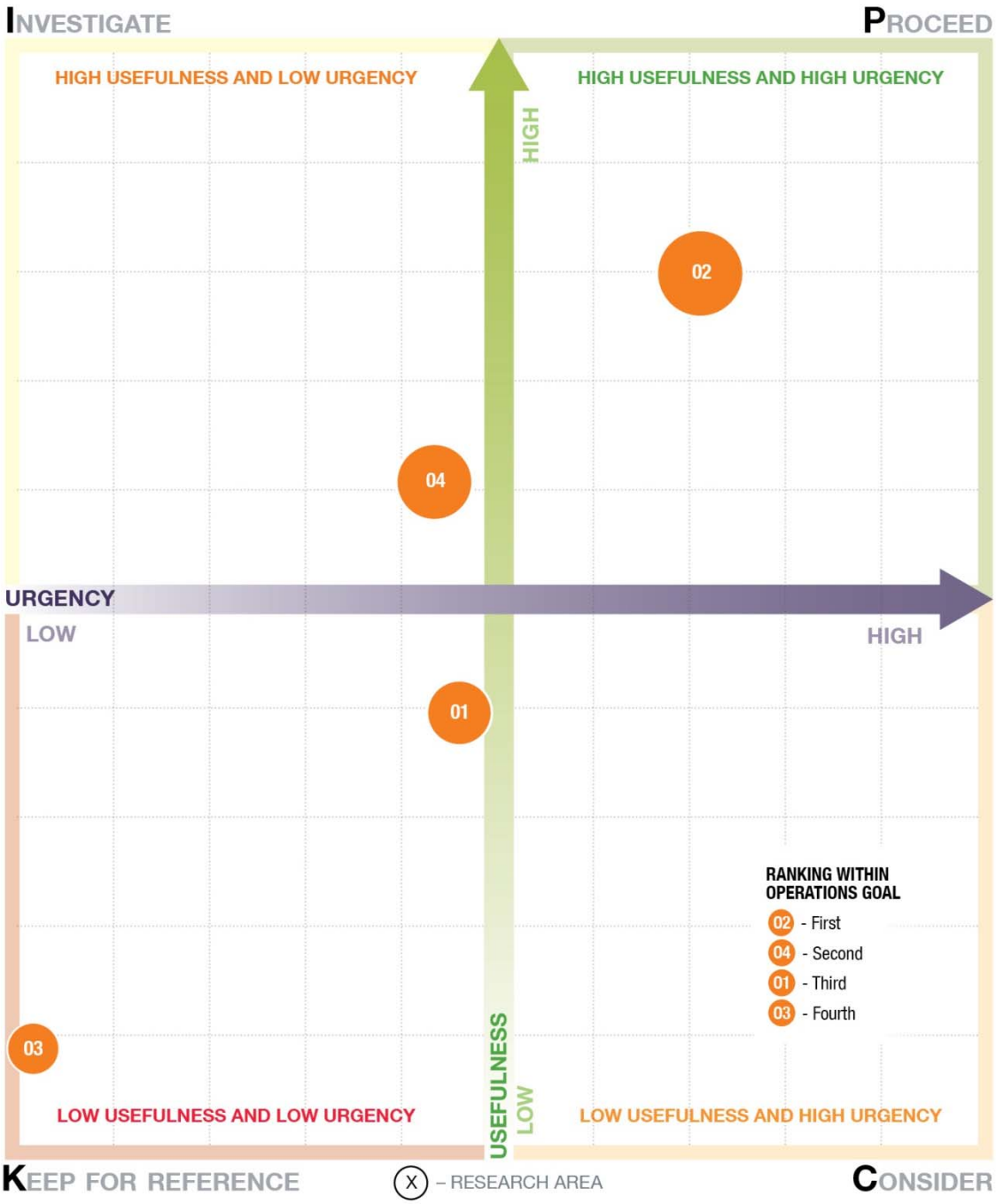


Figure 5 – Operations Usefulness-Urgency Matrix

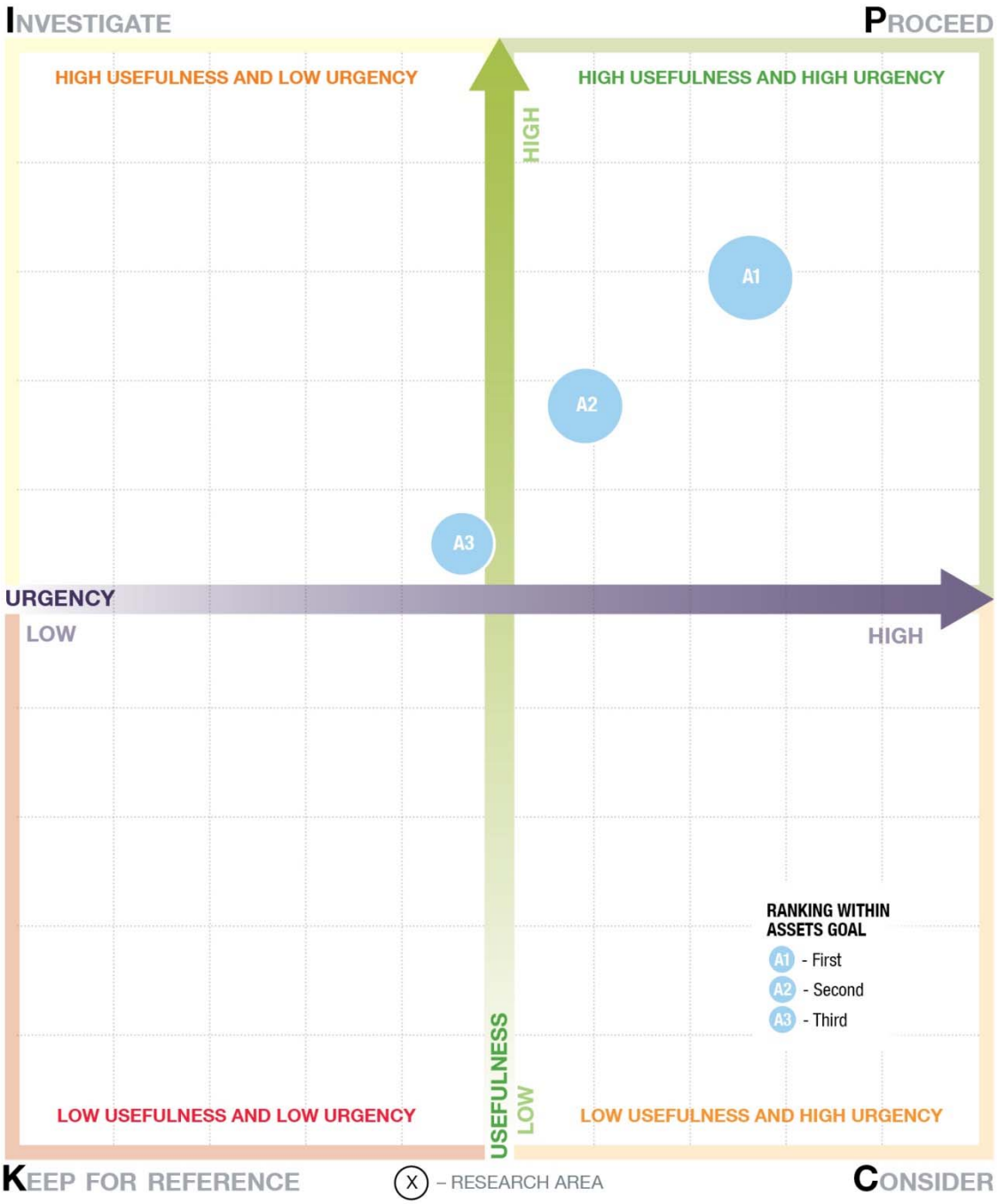


Figure 6 – Assets Usefulness-Urgency Matrix

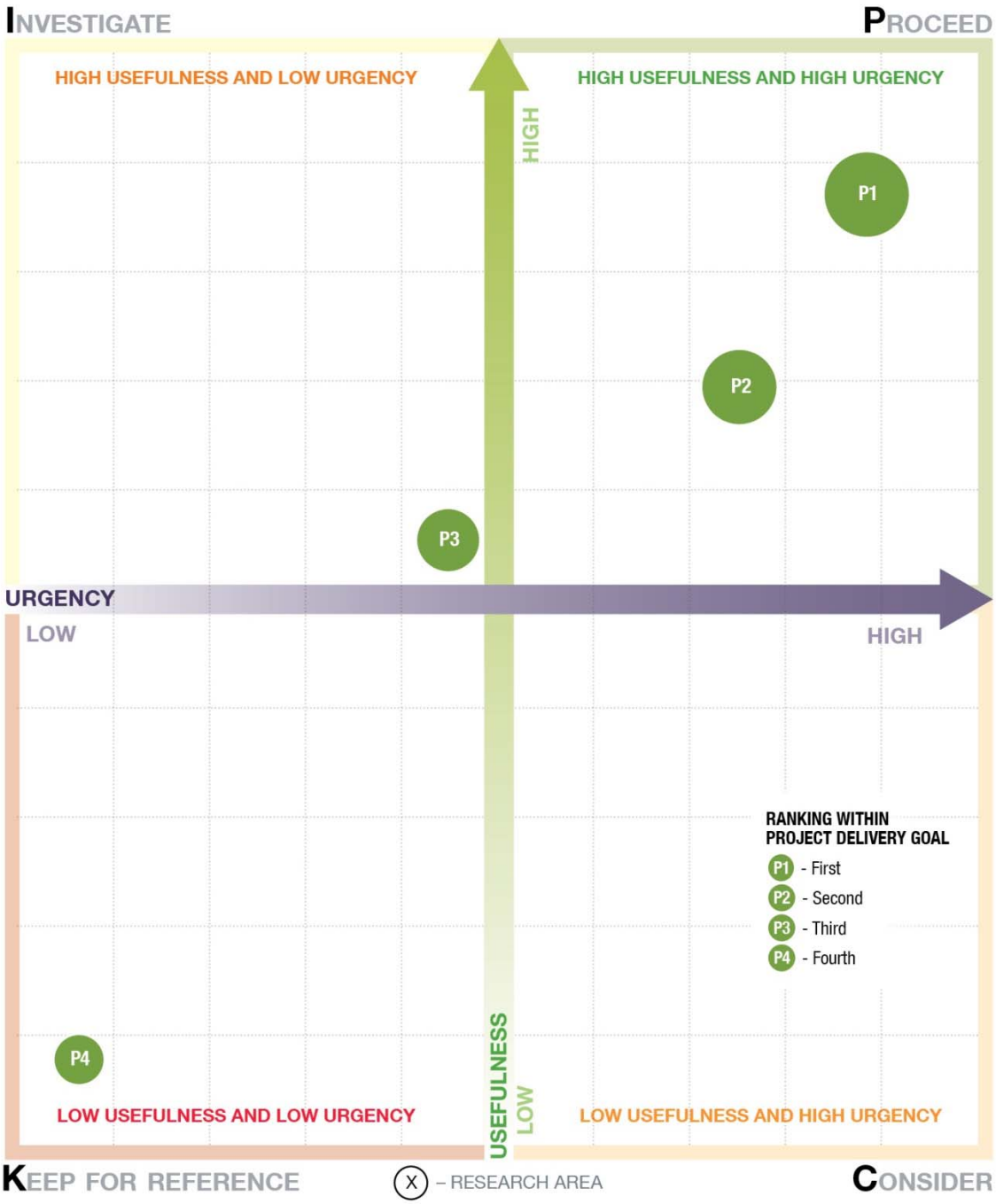


Figure 7 – Project Delivery Usefulness-Urgency Matrix

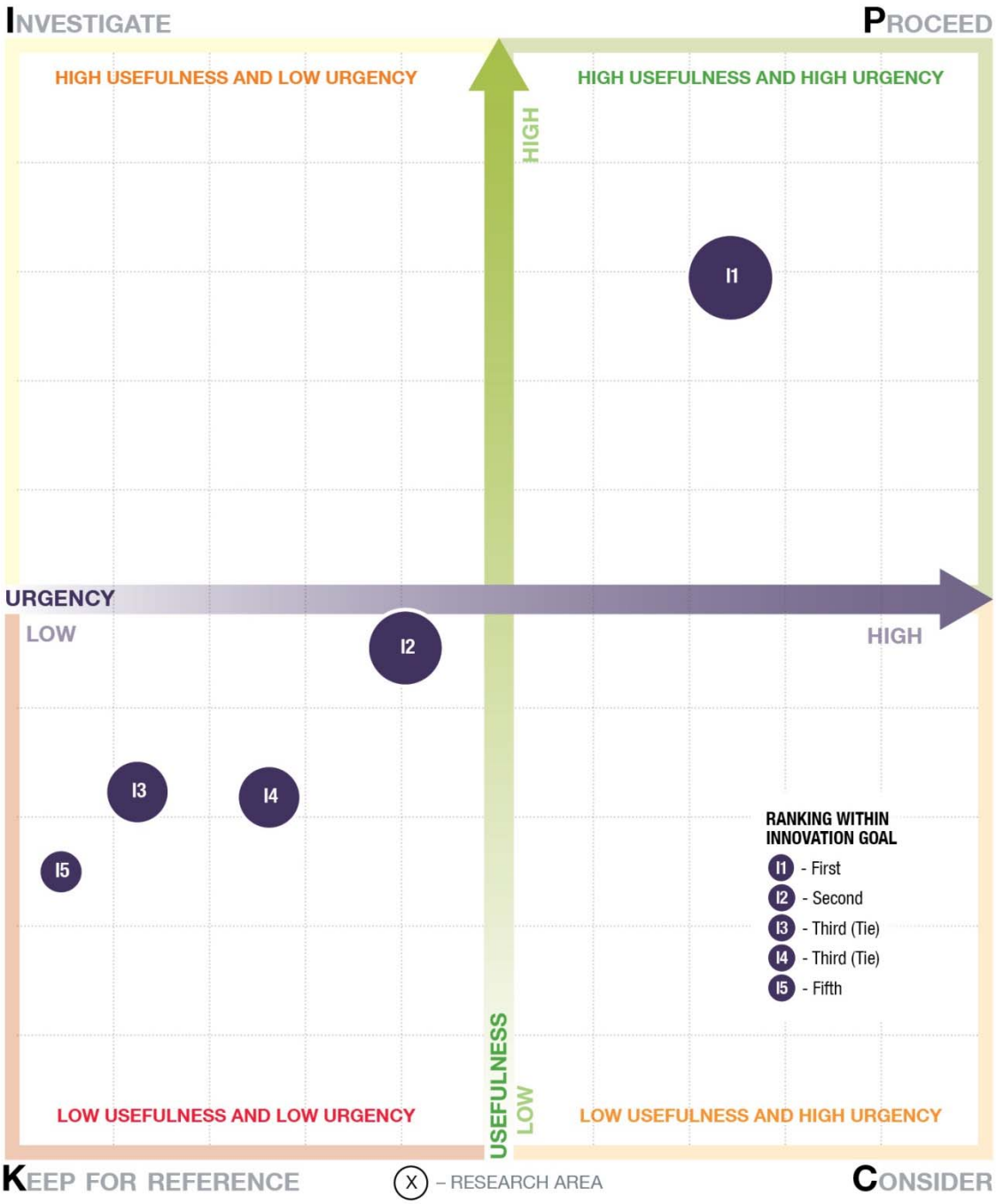


Figure 8 – Innovation Usefulness-Urgency Matrix

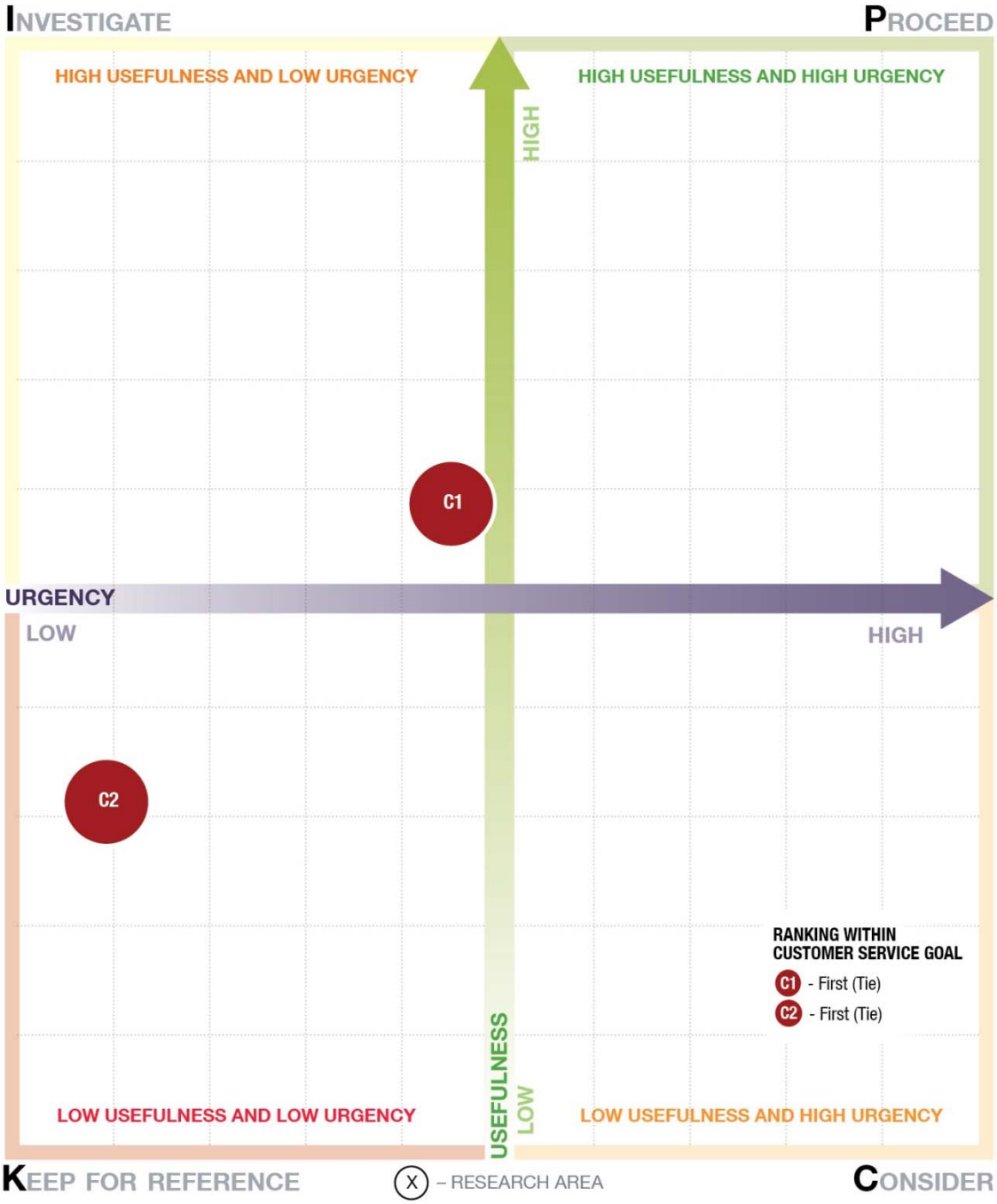


Figure 9 – Customer Service Usefulness-Urgency Matrix

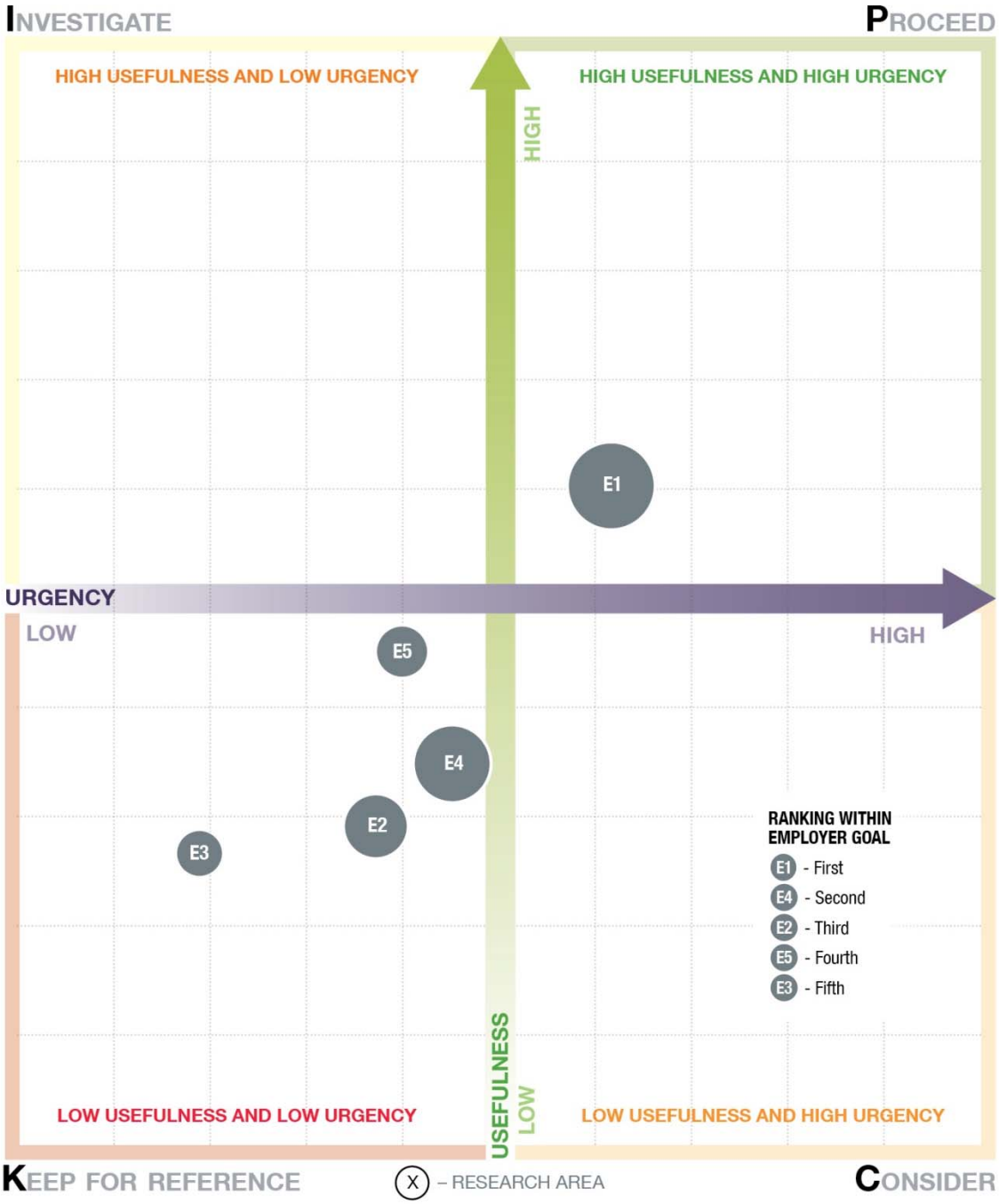


Figure 10 – Employer Usefulness-Urgency Matrix

Figure 11 is the combination of each of the individual strategic goal's usefulness-urgency matrix with the same methodology for determining symbol size used. **Figure 12** is the same usefulness-urgency matrix with the top six voted research areas for the online survey circled.

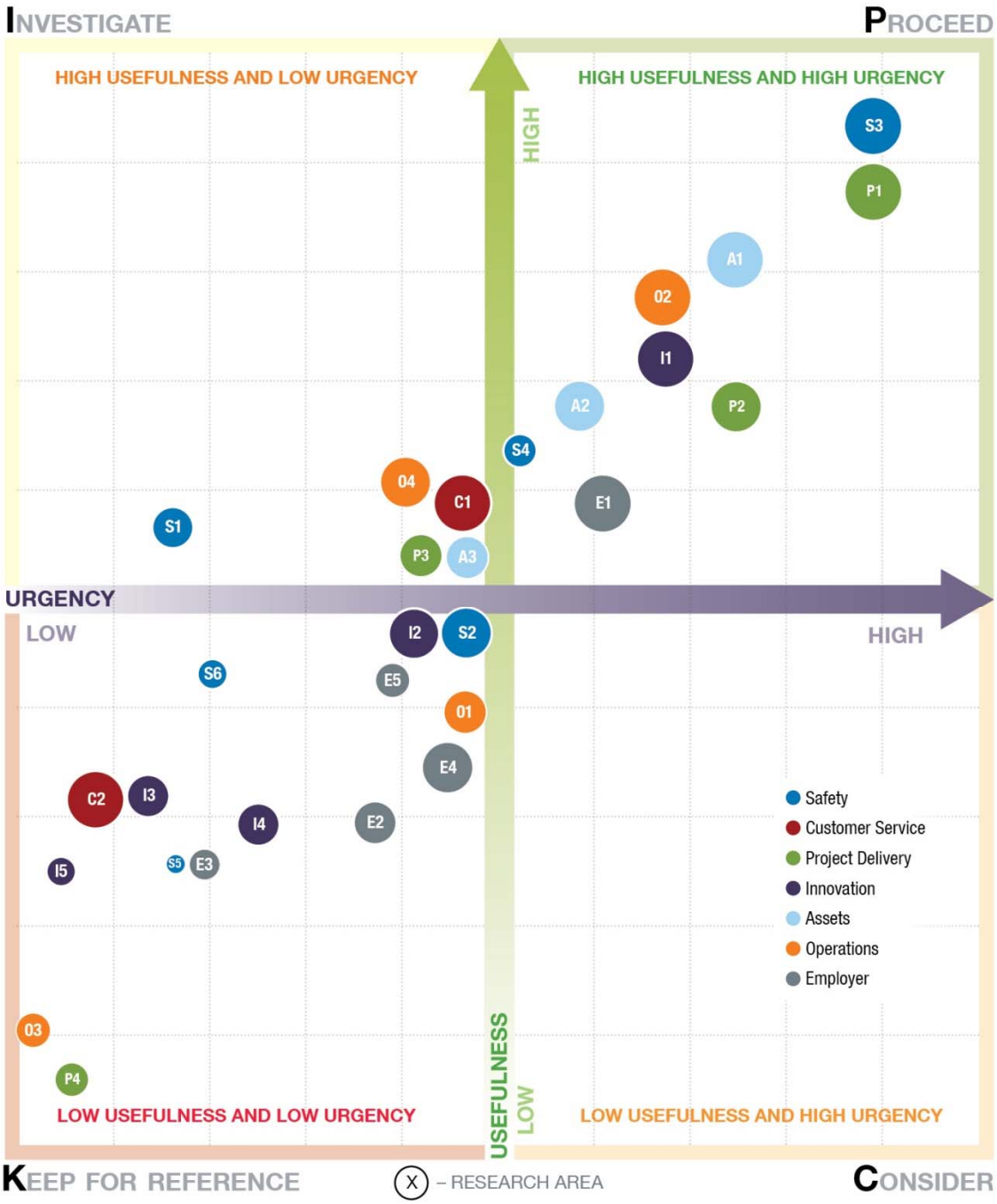


Figure 11 – Usefulness-Urgency Matrix with Ranking

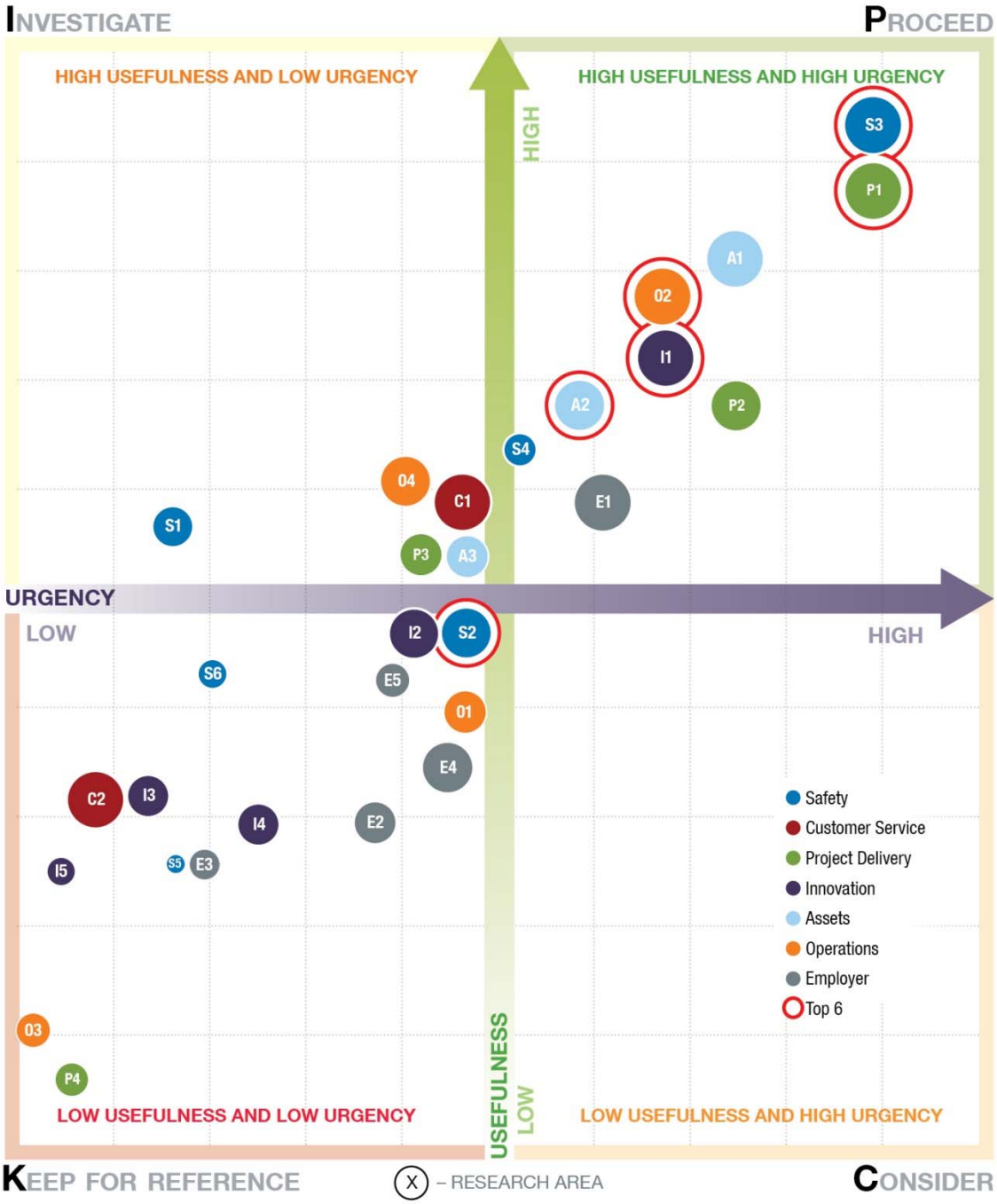


Figure 12 – Usefulness-Urgency Matrix (Top 6)

3.5. Prioritized Research Areas

Based on the results for the survey and the usefulness-urgency matrix there are a total of ten top priority research areas. Top priority research areas come from the ranking of the top six research areas and the research areas within the "Proceed" quadrant of the usefulness-urgency matrix. By selecting future research projects that align with the top priority research areas it ensures that research is completed in accordance with NDOT's Strategic Goals to provide the greatest benefit to the State transportation system and its users. These research areas with their associated strategic goal can be found in **Table 5**. The research questions from the workshops for each of top priority research areas are highlighted in **Appendix E**.

Table 5 – Top Priority Research Areas

NDOT Strategic Goal	Top Priority Research Area
Optimize safety (S)	Employee Safety (S2)
	Road User Safety (S3)
	Safety Effectiveness (S4)
Effectively operate the transportation system (O)	Maintenance and Operation (O2)
Effectively preserve and manage our assets (A)	Asset Management (A1)
	Asset Preservation (A2)
Deliver timely and beneficial projects and programs (P)	Project/Program Prioritization and Selection (P1)
	Project/Program Evaluation and Effectiveness (P2)
Innovate (I)	Technology (I1)
Be the employer of choice (E)	Employee Retention (E1)

4. PERFORMANCE MEASURES

Using the online survey, the stakeholders were asked if they thought that research related performance measures should be included in the Strategic Research Plan. Of the 36 stakeholders who responded to the survey, 29 of those said that performance measures should be included in the plan. Next, the stakeholders were asked to score the quality of a set of four predetermined performance measures on a scale from one to five. A score of one being a very poor performance measure and a score of five being a very good performance measure. Below is the list of predetermined performance measures with their related quality score:

- Percentage of research projects that can be applied to the strategic goals – 3.93
- Percentage of research projects that were on schedule and within budget – 3.17
- Percentage of research projects for which benefits can be documented – 3.90
- Quantify how the research pays off – 3.90

The stakeholders were also given the opportunity to provide additional performance measures through the online survey to be considered. Only one additional performance measure was provided by the stakeholders and is listed below:

- Percentage of research projects that can be applied to national goals

Performance measures are used to improve the evaluation of projects and programs resulting in continued improvement within specific areas of interest. All of these performance measures should be considered for implementation as performance measures for NDOT's future research projects. It is recommended that NDOT consider reporting on these performance measures on a yearly basis to track the progress and improvement of the research program. This is done in an effort to ensure that future research projects are in line with NDOT's Strategic Goals and are focused on the highest priority research areas as defined within this plan.

5. How to Use this Document

This document has been prepared to summarize top priority research areas for NDOT's Strategic Research Plan, to set forth priorities for future NDOT research projects, and to communicate those priorities with internal and external stakeholders. The Strategic Research Plan provides a framework for NDOT's internal stakeholders and its partners to collaborate and ensure research resources are directed to the most crucial of NDOT's needs as chosen by stakeholders through the course of the development of this plan.

This document can be utilized to communicate research priorities to internal and external stakeholders. When NDOT's Research Advisory and Research Management Committees are reviewing problem statements and projects, they can refer to this plan to determine if the projects meet the priority research areas developed by stakeholders through the development of the plan. The committees should also ensure that research efforts do not duplicate other research that has previously been conducted throughout the country. External stakeholder can use this plan when problem statements and projects are being developed to ensure that they align with the top priority research areas. External stakeholders can also look for possible research question ideas in **Appendix B** where the sample research questions from the workshop are found.

6. SUMMARY

It is NDOT's vision that this Strategic Research Plan will cultivate opportunities for collaboration on research with new and existing partners, and target existing NDOT resources to provide the greatest benefit for the State transportation system and its users. The purpose of this project was to develop a Ten-Year Strategic Research Plan for NDOT to set forth priorities for future NDOT research projects and to communicate those priorities internally and externally. It is also the purpose of the Strategic Research Plan to provide a framework for NDOT's internal stakeholders and its partners to collaborate and ensure research resources are directed to the most crucial needs of the Department. The Strategic Research Plan will act as a compass to ensure selected research projects are aligned with NDOT's strategic goals as well as current priorities. Internally, there is a need to help guide which research is proposed and selected by NDOT's Research Advisory and Research Management Committees. There is also the need to communicate NDOT's research priorities externally in order to find partners with matching research interests.

A technical memorandum was prepared to summarize the major national research initiatives and research priorities set forth by four federal transportation agencies. Along with a review of federal research plans two State DOT Strategic Research Plans were summarized. The key aspects summarized in the technical memorandum included plan development methodologies, plan components, and key research areas to help aid NDOT in the development of this Strategic Research Plan. These included Strategic Research Plans from the U.S. DOT, FHWA, FTA, FRA, California, and Texas. Each plan has strengths that was used to help in the development of a Strategic Research Plan to address the research needs of NDOT.

The workshops were designed to allow stakeholders the opportunity to discuss NDOT's Strategic Goals and develop potential research questions that align with these Strategic Goals. Stakeholders included NDOT employees from various departments, NDOT research champions, university researchers, local Metropolitan Planning Organization representatives, local city and county representatives, and FHWA representatives. The results of the workshops were summarized and grouped into research areas. Research areas were determined by grouping questions with like areas of emphasis. This was completed in order to show what potential research areas exist within each of NDOT's Strategic Goals based on stakeholder input.

Following the workshops and the development of research areas an online survey was sent out to all stakeholders to allow them to provide input toward the ranking and prioritization of the different strategic goals and research areas. Thirty-six of the 96 total stakeholders completed the online survey. As part of the survey each of the respondents was asked to rank NDOT'S Strategic Goals in order of priority based on research needs. Following are the strategic goals listed in order of priority based on the survey responses:

- Optimize safety
- Effectively operate the transportation system
- Effectively preserve and manage our assets
- Deliver timely and beneficial projects and programs
- Innovation
- Be in touch with and responsive to customers
- Be the employer of choice

Each research area was individually ranked on the usefulness of the research in that area and the urgency to perform research in that area. The different research areas were graphed on a usefulness-urgency matrix with respect to their individual usefulness and urgency scores. Next, each responded was asked to pick what should be NDOT's top five priority research areas from the complete list of research areas from all seven strategic goals. Based on the results for the survey and the usefulness-urgency matrix there are a total of ten top priority research areas. Top priority research areas come from the ranking of the top five research areas and the research areas within the "Proceed" quadrant of the usefulness-urgency matrix. By selecting future research projects that align with the top priority research areas it ensures that research is done in accordance with NDOT's Strategic Goals to provide the greatest benefit to the State transportation system and its users. Research areas found in quadrants other than the "Proceed" quadrant of the usefulness-urgency matrix can still be considered for research when additional needs arise, they just should not be considered as a top priority research area. The top priority research areas are listed as follows:

- Employee Safety (S2)
- Road User Safety (S3)
- Safety Effectiveness (S4)
- Technology (I1)
- Employee Retention (E1)
- Project/Program Prioritization and Selection (P1)
- Project/Program Evaluation and Effectiveness (P2)
- Asset Management (A1)
- Asset Preservation (A2)
- Maintenance and Operations (O2)

Of the 36 stakeholders who responded to the survey, 29 of those said that performance measures should be included in the plan. The following list of performance measures should be considered for implementation as performance measures for NDOT's future research projects:

- Percentage of research projects that can be applied to the strategic goals
- Percentage of research projects that were on schedule and within budget
- Percentage of research projects for which benefits can be documented
- Quantify how the research pays off
- Percentage of research projects that can be applied to national goals

It is recommended that NDOT consider reporting on these performance measures on a yearly basis to track the progress of the research program. This is done in an effort to ensure that future research projects are in line with NDOT's Strategic Goals and are focused on the highest priority research areas.

APPENDIX A

WORKSHOP ATTENDEES

WORKSHOP SIGN-IN-SHEET

Kick-Off	WS #1	WS #2	WS #3	Last Name	First Name	Agency/Department	Phone	E-Mail
	HQ			Aiyuk	Peter	NDOT	775-888-7192	paiyuk@dot.state.nv.us
HQ	HQ			Bafghi	Abbas	NDOT	775-888-7876	abafghi@dot.state.nv.us
			HQ	Balbuena-Merle	Juan	FHWA	775-687-8582	juan.balbuena@dot.gov
	D1			Benoit	Jim	CCPW	702-455-6054	jbenoit@clarkcountynv.gov
HQ				Bush	Anita	NDOT	775-888-7856	abush@dot.state.nv.us
	HQ			Chambers	Ken	NDOT Research	775-888-7220	kchambers@dot.state.nv.us
Phone				Colety	Mike	Kimley-Horn	702-862-3609	mike.colety@kimley-horn.com
	HQ			Crick	Craig	NDOT	775-888-7807	ccrick@dot.state.nv.us
HQ				Daniels	Seth	NDOT Traffic Operations	775-888-7565	sdaniels@dot.state.nv.us
	HQ			Elfass	Sherif	UNR/CEE	775-784-6664	elfass@unr.edu
Phone	D1	D1	D1	Farnsworth	Jacob	Kimley-Horn	702-862-36094	jacob.farnsworth@kimley-horn.com
	HQ			Freeman	Jeff	NDOT Construction	775-888-7662	jfreeman@dot.state.nv.us
	HQ			Fuentes	Oscar	NDOT Safety	775-888-7078	ofuentes@dot.state.nv.us
			D2	Fuess	Michael	NDOT	775-834-8300	mfuess@dot.state.nv.us
	HQ			Garza	Ismael	NDOT Traffic Operations	775-888-7087	igarza@dot.state.nv.us
	D1			Ghafoori	Nader	UNLV	702-895-2531	nadir.ghafoori@unlv.edu
			D2	Giacomin	David	Kimley-Horn	775-200-1981	david.giacomin@kimley-horn.com
			D2	Gibson	Scott	RTC Washoe	775-335-1874	sgibson@rtcwashoe.com
HQ				Griswold	Mike	NDOT Materials	775-888-7781	mgirswold@dot.state.nv.us
	HQ			Hajj	Elie	UNR/CEE	775-784-1180	elieh@unr.edu
HQ	HQ			Hale	Steve	NDOT Construction	775-888-7226	shale@dot.state.nv.us
		D1		Hayes	Don	UNLV	702-895-4723	donald.hayes@unlve.edu
		D1		Hess	Raymond	RTC-SNV	702-676-1729	hessr@rtcsnv.com

WORKSHOP SIGN-IN-SHEET

Kick-Off	WS #1	WS #2	WS #3	Last Name	First Name	Agency/Department	Phone	E-Mail
HQ				Hong	Hoang	NDOT Traffic Operations	775-888-7018	hhong@dot.state.nv.us
HQ			Phone	Inda	Denise	NDOT Traffic Operations	775-888-7867	dinda@dot.state.nv.us
	HQ			Kaiser	Reid	NDOT	775-888-7520	rkaiser@dot.state.nv.us
			D1	Khalili	Mehdi	UNLV	702-845-1683	khalilim@unlv.nevada.edu
	HQ			King	Kimberly	NDOT Human Resources	775-888-7130	kking@dot.state.nv.us
	HQ			Kiser	P.D.	NDOT	775-888-7459	pkiser@dot.state.nv.us
HQ	HQ	HQ	HQ	Kumar	Manjunathan	NDOT Research	775-888-7803	mkumar@dot.state.nv.us
	HQ			Leach	Christina	FHWA	775-687-8580	christina.leach@dot.gov
	D3			Lee	Kevin	NDOT	775-777-2700	klee@dot.state.nv.us
HQ				Leon	Edgar	NDOT Traffic Operations	775-888-7563	eleon@dot.state.nv.us
	HQ			Li	Haiyuan	NDOT	775-888-7191	hli@dot.state.nv.us
HQ				Lidder	Mylinh	NDOT Maintenance and Asset Management	775-888-7854	mlidder@dot.state.nv.us
	HQ			Lindsey	Dale	NDOT Performance Analysis	775-888-7190	dlindsey@dot.state.nv.us
HQ	HQ			Maher	Michele	NDOT Materials	775-888-7737	mmaher@dot.state.nv.us
HQ				Mammen	Ken	NDOT	775-888-7335	kmammen@dot.state.nv.us
HQ			Phone	Martin	Troy	NDOT Structures	775-888-7380	tmartin@dot.state.nv.us
	HQ			Merrill	Steve	NDOT Location	775-888-7250	smerrill@dot.state.nv.us
HQ				Njoroge	Boniface	NDOT	775-888-7811	bnjoroge@dot.state.nv.us
HQ	HQ	D1	D2	O'Brien	Molly	Kimley-Horn	775-200-1979	molly.obrien@kimley-horn.com
	HQ			Olsen	David	NDOT Accounting	775-888-7451	dolsen@dot.state.nv.us
			D1	Patel	Shital	FAST	702-432-5310	patels@rtcsnv.com
Phone	D1	D1		Paz	Alex	UNLV	702-688-3878	apaz@unlv.edu

WORKSHOP SIGN-IN-SHEET

Kick-Off	WS #1	WS #2	WS #3	Last Name	First Name	Agency/Department	Phone	E-Mail
			HQ	Peacock	Coy	NDOT	775-888-7124	cpeacock@dot.state.nv.us
		D1		Penuelas	John	City of Henderson	702-267-3080	john.penuelas@cityofhenderson.com
Phone				Poston	Jim	RTC Washoe	775-332-2139	jposton@rtcwashoe.com
	HQ			Rosenberg	Sandra	NDOT Planning	775-888-7241	srosenberg@dot.state.nv.us
	D1	D1		Rouas	Mohamed	NDOT	702-385-6503	mrouas@dot.state.nv.us
	D1	D1		Shrestha	Pramen	UNLV	702-895-3841	pramen.shrestha@unlv.edu
	HQ			Siddharthan	Raj	UNR/CEE	775-784-1411	siddhart@unr.edu
HQ	HQ			Siegel	Ronald	NDOT Geotechnical	775-888-7529	rsiegel@dot.state.nv.us
	HQ			Stearns	Barbara	NDOT	775-888-7806	bstearns@dot.state.nv.us
		HQ		Story	Bill	NDOT	775-888-7433	wstorey@dot.state.nv.us
	D3			Strickland	Dennis	Elko Public Works	775-777-7241	dstrickland@ci.elko.nv.us
			D2	Thomas	Janelle	NDOT	775-834-8300	jthomas2@dot.state.nv.us
	D1			Tian	Ying	UNLV	702-895-4917	ying.tian@unlv.edu
HQ			D2	Tian	Zong	UNR	775-784-1232	zongt@unr.edu
			HQ	Travis	Randy	NDOT	775-888-7158	rtravis@dot.state.nv.us
		HQ		Tuddao	Jaime	NDOT Safety	775-888-7467	jtuddao@dot.state.nv.us
	HQ			VanHavel	Jason	NDOT Intermodal	775-888-7119	jvanhavel@dot.state.nv.us
HQ	HQ			Wolf	Charlos	NDOT Hydraulics	775-888-7622	cwolf@dot.state.nv.us
	HQ			Xu	Hao	UNR	775-784-6909	hoax@unr.edu
	HQ			Yang	Jolene	NDOT	775-888-7987	jyang@dot.state.nv.us
HQ	HQ			Yatheepan	Yathi	NDOT Materials	775-888-7875	yyatheepan@dot.state.nv.us
HQ				Young	Chris	NDOT Environmental	775-888-7687	cyoung@dot.state.nv.us

APPENDIX B

RESEARCH AREAS AND QUESTIONS

SUMMARY OF QUESTIONS DEVELOPED IN WORKSHOPS

Optimize Safety

- **Safety Technology (S1)**
  - What tools, technologies, and policies should be implemented to improve administrative, engineering, or on-site safety controls?
  - How do we make the innovative safety technologies available today a reality on all cars in a shorter timeframe?
  - How to utilize the latest technological developments to improve existing safety practices in Nevada?
- **Employee Safety (S2)**
  - What can be done to improve safety for NDOT employees?
  - How does the State of Nevada compare to other states with workers' comp costs and inquires? What are some ideas to improve in this area?
  - How to improve worker and public safety during construction and maintenance operations in a freeway environment?
  - How do we improve worker and public safety in work zones?
  - What should we be doing for fleet replacement and rebuild from an employee safety perspective?
- **Road User Safety (S3)**
  - What design features and construction standards can be utilized to improve highway safety?
  - Are the current clear zone standards used by NDOT sufficient for today's vehicle speeds and impaired/distracted drivers?
  - How can we improve transit safety and get people to more fully use transit?
  - How do we improve safety for all road users, including pedestrians, bicyclists, transit stops, etc.?
  - What should our asset preservation strategy be in order to provide an acceptable level of safety for our clients?
  - How to achieve multi-agency cooperation to improve traffic safety in Nevada?
  - How to enable the implementation of the Highway Safety Manual?
  - Which methods of the "fast repair" can be used to improve the safety of the roadways?
  - How do we balance competing safety objectives?
  - What processes can be utilized to optimize all components of safety?
  - What is the impact of driverless vehicles on safety?
- **Safety Effectiveness (S4)**
  - What demographic groups in Nevada are not receiving safety messages and how do we best reach this group?
  - How can NDOT implement a before and after study program to determine the effectiveness of safety countermeasures post project?
- **Crash Data/Info (S5)**
  - How can we leverage existing crash data to develop systemic improvements on our roadways?
  - How can we better use our crash data?
  - How to improve the reporting, quality, accuracy, and consistency of crash data?
  - How can we provide crash data quicker?
  - How do we improve data collection of non-vehicular modes?
  - How do we improve the reliability of real-time crash and road information to drivers?
  - How do we improve the integration of crash data and ITS data?
  - Do we need to continue to collect PDO crash data? If so, what are the available methods for collecting this data (i.e., insurance companies)?
- **Safety Education and Training (S6)**

SUMMARY OF QUESTIONS DEVELOPED IN WORKSHOPS

- How can we educate drivers on traffic technologies?
- How can education (schools, DMV, …) help the State DOT to improve safety?
- What should our maintenance and safety training program look like to maintain the safety and skills we need in our every changing environment?

Be in touch with and responsive to customers

- **Involvement with Other Agencies (C1)**
  - How can customers provide input or response to NDOT's activities and make sure they are heard?
  - How can we stay apprised of what our customers want, need, and desire to attract and retain communities in our State?
  - How do we align ourselves to better meet the needs of our clients and make the transition with the local system more seamless?
  - What are the benefits and costs associated with the Freeway Service Patrol?
  - How can we provide economic growth and tie projects to growth?
  - How can we make it easier for outside agencies to work with NDOT?
  - What are the decision making paths through NDOT for specific projects?
  - How do people know how/who to get answers to specific questions?
  - How can we provide data quicker?
- **Involvement with the General Public (C2)**
  - What can we do to reduce impacts to and better protect the natural and physical environment?
  - What do we want our image to be at NDOT and how do we better market that image to the public?
  - How can we better understand the public's perceived issues and knowledge of the roadways system?
  - How can we develop strategies for improving public knowledge of transportation issues?
  - How can we help the public distinguish between need versus want?
  - What are the best ways to log, and ensure a timely response to public requests?
  - What methods are there for input from Nevadans and/or the public about NDOT's transportation system and services?
  - How can we be more transparent to the public to provide them the information they want?
  - Are there best practices for NDOT to communicate with the public about project benefits?
  - Which methods can be used to rank the customer's needs based on their priorities?
  - What is the impact of electric vehicles and the ability to provide services to the public to support these vehicles?

Innovation

- **Technology (I1)**
  - What information affects driver behavior and how do we deliver it through technology to improve that behavior (Applications)?
  - How can innovations in testing and measurement can help NDOT divisions (materials, safety, etc.) to come up with faster and less expensive practices?
  - How can GIS Technologies be used to improve operations within NDOT?
  - What is the benefit and cost of solar roadways to generate power?
- **Planning and Operations (I2)**
  - How can NDOT change their cultural mindset to manage risk versus multi-gaining risk?
  - What planning tools are available for implementing real costs and incorporating all disciplines?

SUMMARY OF QUESTIONS DEVELOPED IN WORKSHOPS

- What strategies can we use for demand management strategies?
- How to incorporate sustainability considerations within NDOT's current practices?
- What innovative strategies are most effective in reducing travel demand by enhancing choices?
- How can we plan for the mobility of humans and goods instead of just vehicles?

- **Materials and Assets(I3)**
  - How do we research the cost benefits of using cold millings in "rap" instead of as shouldering material?
  - How to achieve timely and efficient inspection of infrastructures such as bridges?
  - How do we develop materials within concrete that can create low levels of power that could be used to create illumination or light signage?
  - How can roadway materials be used to remove pollutants from the air?
- **Funding and Economics (I4)**
  - Are economic development factors being taken into consideration and how should they be used for project prioritization?
  - Are the estimated economic benefits accounted for at the end of the project?
  - Are there more innovative ways to fund projects?
  - Should we develop other ways to fund innovate projects?
- **Organizational and Internal Processes (I5)**
  - How do we better research the results of our systems and there reliability and accuracy?
  - How do you measure the various project delivery methods' performance?
  - How to select best project delivery methods for fostering innovation in planning, design, and implementation of projects?
  - How to best streamline the research procurement/proposal process to support NDOT's needs?
  - Are there ways to reduce fear of chance and innovation?
  - What strategies could NDOT utilize to improve internal departmental processes or external project management activities?
  - How can the DOT better insure consistency between districts and Head Quarters?

Be the employer of choice

- **Employee Retention (E1)**
  - What are the most effective strategies to attract, select, and retain qualified employees?
  - How is retention related to being competitive with other public agencies?
  - How do we better retain NDOT's current EEs through keeping them engaged and challenged?
  - Can we retain the expertise in house as oppose to contracting out for expertise?
  - How do we retain and provide a career track for these key people?
- **Hiring (E2)**
  - How do we better reach out to our applicant pool especially to minorities and women?
  - How do we promote the best features of NDOT and Nevada?
  - What is the performance of the summer intern program at attracting people to NDOT?
  - How do we get the right person in the right position?
  - What are the key positions of our agency and what are the required skill sets for those positions?
  - How do we attract and recruit qualified staff for our positions?
- **Employee Training (E3)**
  - What skills are necessary from employees and what tools, training, and resources need to be provided to those employees to develop an excellent workforce that provides quality service?

SUMMARY OF QUESTIONS DEVELOPED IN WORKSHOPS

- How do we educate and train these EE's in house so we don't lose them?
- What kind of training should be provided to NDOT employees?
- What methods can NDOT management use to educate the employees?
- How can NDOT management reduce the damages to its properties by non-skillful employees?
- How do we train and motivate staff to maintain their effectiveness?
- How do we educate and train qualified staff for our positions?
- When does an apprenticeship program make sense and how do we do this?
- How do we provide employees with challenging work?

- **Compensation Package (E4)**
  - Is there other DOT's that reward employees with performance based bonuses and how would this be implemented at NDOT?
  - What is a competitive compensation policy for similar government/private positions and how does NDOT become competitive?
  - What does team building and employee incentive programs make sense and how do we do this?
- **Work Environment (E5)**
  - What are the most effective ways to improve communication between NDOT management and employees?
  - How do we get better cooperation/coordination between political and administrative?
  - How effective and cost effective would a work from home program be? Partial or full time?
  - What are the things that people really care about?
  - How do we overcome barriers in policy and state law?
  - What should we look like as a transportation agency and how does that compare with what we are?
  - How do we compare with other similar agencies?
  - What are effective strategies to boost employee loyalty?

Deliver timely and beneficial projects and programs

- **Project/Program Prioritization and Selection (P1)**
  - How can we effectively select projects based on a regional and statewide level analysis?
  - How to synchronize structures, materials, traffic, and construction as integrated components for decision making?
  - How do the "matrix management" principles work in the delivery of projects compared to the traditional management method?
  - How do we better evaluate and prioritize projects to meet regional and statewide needs and meet the transparency needs of our customers?
  - How can we prioritize projects for both the long-term and short-term benefits and what balance is needed with this type of prioritization?
  - How do we anticipate and account for future needs?
- **Project/Program Evaluation and Effectiveness (P2)**
  - How can we establish and meet the purpose, need, and quality level of the project throughout the project development process?
  - How do we follow-up with stakeholders to determine if the goals of the project were met?
  - What method is the most effective for the future: retaining knowledge in-house or externally?
  - How do you measure the strategic goals of the project?
  - How will NDOT comply with Map-21 requirements for performance measures?
  - How do you measure "timely and beneficial projects and programs"?

SUMMARY OF QUESTIONS DEVELOPED IN WORKSHOPS

- How do we as an agency focus on getting the job done rather than me as an employee making my job easier by doing my job most effectively?
- When is flexibility appropriate to get the job done?
- What is the good and the bad of doing projects in phases?
- How do we develop programs for trial projects that may not run through the regular proposal system?

- **Project/Program Cost and Benefit (P3)**
  - How can we get the best value from capital dollars and provide proof of that value?
  - What ways are there to get funds not related to federal grants?
  - How to evaluate "super project" funding prioritization on the general conditions of the rest of the system (decline in IRI)?
  - How can we develop a better and more reliable long range plan that still takes into consideration benefit-cost to the public?
  - What is the most cost effective process for projects: in-house or contractor/consultant?
  - What are the cost and schedule performance measures of constructed projects?
- **Project/Program Data (P4)**
  - How is the overall relevance and usability of the data?
  - Will the data be useful in the timeframe that is relevant to the process of recognition/reaction by the agency?
  - Can the data be applied before the useful life of the data is reached?
  - How can cost and schedule data of constructed projects be used to develop effective strategies for delivering timely and beneficial projects and programs?

Effectively preserve and manage our assets

- **Asset Management (A1)**
  - How can we plan, budget, and implement efficient maintenance and operations of what we build?
  - How can we improve inventory of assets and information?
  - How to optimize decision making regarding seismic rehabilitation that integrates structural safety, life cycle cost, constructability, and impact on traffic?
  - How do we better manage our assets through life-cycle evaluation?
  - What activities does NDOT do best and what should we contract out?
  - How can we better use GIS systems to manage our assets?
  - How can we better communicate all information?
  - How to determine the latest and better lighting technology?
  - What sign materials should be used so that lights aren't required?
  - How can we use technology to improve asset management?
  - What does an effective asset management program look like?
  - What resources are required to meet our published goals?
  - What are the implications of not providing additional resources to meet our published goals?
  - What innovative and outside of the box ways can we look at to reduce traffic volumes on our roadways?
  - How can we increase system resilience by improving earthquake performance and post-earthquake recovery?
- **Asset Preservation (A2)**
  - What are the effects of decreasing maximum allowable esals?
  - How is the effectiveness of various asphalt blends for preservation and chip seal?
  - What are the differences between contractor and NDOT placed overlays?

SUMMARY OF QUESTIONS DEVELOPED IN WORKSHOPS

- How can we effectively use the new and emerging technologies to assess the conditions of assets?
- How to optimize repair and rehabilitation strategies of assets?
- Is there an optimal maintenance strategy for a given asset and if there is, is it worth the cost?
- Why do pavement marking last less time here than in other places?
- How long will signs last in this environment?
- What is the relationship between capacity and pavement preservation?
- How do we develop more durable materials?
- What new materials can be used to help reduce cracking and thermal expansion?

- **Cost and Funding (A3)**
  - How much does it actually cost to maintain our assets?
  - How do we demonstrate the effects of various funding allocations on the transportation system network?
  - How do we best use our limited resource ($) and state forces versus contracting out?
  - How do we attract private money?
  - How can the maintenance be done cost effectively with life-cycle reliability?
  - How the various construction methods can impact the life-cycle cost and reliability of the assets?
  - How can we assess the benefits and costs of recycling?
  - What is the benefit/cost of a global system management program?
  - How can we improve our understanding of environmental impact of assets in the lifecycle cost analysis?
  - How can we better prepare for and measure lifecycle costs in asset decisions?

Effectively operate the transportation system

- **Data Management (O1)**
  - How can we improve/enhance data collection, synthesis, and use across modes?
  - Are there opportunities to collect and use more data from the arterials to operate them better?
- **Maintenance and Operations (O2)**
  - How can we manage incidents to reduce effects on traffic and improve system reliability?
  - What are the best uses for ITS?
  - How can we improve freight movement and economic vitality?
  - How can we improve truck parking?
  - How to determine what information to provide to highway users?
  - What resources do we need to effectively operate the transportation system and how do we get those resources properly allocated?
  - How do we take advantage of modern technologies to improve maintenance efforts such as snow and ice mitigation?
  - How do we plan for the raising baby boomer generation?
- **Integration of all Modes of Transportation (O3)**
  - How can we get people to step out of their vehicle and using alternative modes?
  - Do roadways work better with BRT in place?
  - How can we collect better data and more accurate data on all modes?
- **System Optimization (O4)**
  - How do we sell the DOT's needs to politicians?
  - What methods/innovations can be used to optimize movement during the construction/repair on the roadway?
  - What is the most effective ways to optimize movement and mobility through corridors?

SUMMARY OF QUESTIONS DEVELOPED IN WORKSHOPS

- What is the effectiveness of existing systems?
- What instrumentation is available to improve predicting truck loads, traffic volumes, and decision making for both planners and real time users?

APPENDIX C

ONLINE SURVEY

NDOT Research Strategic Plan Survey

Survey Introduction

This online survey is in conjunction with the three workshops held to help in the development of NDOT's Research Strategic Plan.

The vision of NDOT's Research Strategic Plan is to cultivate opportunities for collaboration on research with new and existing partners, and target existing NDOT resources to provide the greatest benefit for the State transportation system and its users.

At the three workshops an extensive list of research questions was developed in relation to NDOT's current Strategic Goals. NDOT's Strategic Goals are listed below:

- Optimize safety
- Be in touch with and responsive to customers
- Innovate
- Be the employer of choice
- Deliver timely and beneficial projects and programs
- Effectively preserve and manage our assets
- Effectively operate the transportation system

The list of research questions was used to create Research Areas within each of NDOT's Strategic Goals. The purpose of this survey is to help with the prioritization and ranking of NDOT's Strategic Goals and their associated Research Areas as it relates to research.

THE RESULTS OF THIS SURVEY WILL REMAIN ANONYMOUS. Please remember to complete each question and answer all questions in terms of how it deals with research.

Thank you for your participation!

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

NDOT Research Strategic Plan Survey

Employment Type

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

1. Which of the following best describes your employer?

- ◯ NDOT
- ◯ Other Public Agency
- ◯ University
- ◯ Private Consultant

NDOT Research Strategic Plan Survey

NDOT's Strategic Goals

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

2. Rank the NDOT Strategic Goals in Order of Priority based on Research Needs.

- [ ] Optimize safety
- [ ] Be in touch with and responsive to our customers
- [ ] Innovate
- [ ] Be the employer of choice
- [ ] Deliver timely and beneficial projects and programs
- [ ] Effectively preserve and manage our assets
- [ ] Efficiently operate the transportation system

NDOT Research Strategic Plan Survey

Strategic Goal - Optimize Safety

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

3. Rank the Research Areas within the "OPTIMIZE SAFETY" Strategic Goal?

- [ ] Safety Technology
- [ ] Employee Safety
- [ ] Road User Safety
- [ ] Safety Effectiveness
- [ ] Crash Data/Info
- [ ] Safety Education and Training

4. USEFULNESS: Rank the following Safety Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

	Very Low		Medium		Very High
Safety Technology	◯	◯	◯	◯	◯
Employee Safety	◯	◯	◯	◯	◯
Road User Safety	◯	◯	◯	◯	◯
Safety Effectiveness	◯	◯	◯	◯	◯
Crash Data/Info	◯	◯	◯	◯	◯
Safety Education and Training	◯	◯	◯	◯	◯

5. URGENCY: Rank the following Safety Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

	Very Low		Medium		Very High
Safety Technology	◯	◯	◯	◯	◯
Employee Safety	◯	◯	◯	◯	◯
Road User Safety	◯	◯	◯	◯	◯
Safety Effectiveness	◯	◯	◯	◯	◯
Crash Data/Info	◯	◯	◯	◯	◯
Safety Education and Training	◯	◯	◯	◯	◯

NDOT Research Strategic Plan Survey

Strategic Goal - Be in touch and responsive to customers

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

6. Rank the Research Areas within the "BE IN TOUCH WITH AND RESPONSIVE TO CUSTOMERS" Strategic Goal?

☐	Involvement with Other Agencies
☐	Involvement with the General Public

7. USEFULNESS: Rank the following Customer Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

	Very Low		Medium		Very High
Involvement with Other Agencies	◯	◯	◯	◯	◯
Involvement with the General Public	◯	◯	◯	◯	◯

8. URGENCY: Rank the following Customer Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

	Very Low		Medium		Very High
Involvement with Other Agencies	◯	◯	◯	◯	◯
Involvement with the General Public	◯	◯	◯	◯	◯

NDOT Research Strategic Plan Survey

Strategic Goal - Deliver timely and beneficial projects and programs

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

9. Rank the Research Areas within the "DELIVER TIMELY AND BENEFICIAL PROJECTS AND PROGRAMS" Strategic Goal?

- [ ] Project/Program Prioritization and Selection
- [ ] Project/Program Evaluation and Effectiveness
- [ ] Project/Program Cost and Benefit
- [ ] Project/Program Data

10. USEFULNESS: Rank the following Project Delivery Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

	Very Low		Medium		Very High
Project/Program Prioritization and Selection	◯	◯	◯	◯	◯
Project/Program Evaluation and Effectiveness	◯	◯	◯	◯	◯
Project/Program Cost and Benefit	◯	◯	◯	◯	◯
Project/Program Data	◯	◯	◯	◯	◯

11. URGENCY: Rank the following Project Delivery Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

	Very Low		Medium		Very High
Project/Program Prioritization and Selection	◯	◯	◯	◯	◯
Project/Program Evaluation and Effectiveness	◯	◯	◯	◯	◯
Project/Program Cost and Benefit	◯	◯	◯	◯	◯
Project/Program Data	◯	◯	◯	◯	◯

NDOT Research Strategic Plan Survey

Strategic Goal - Innovation

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

12. Rank the Research Areas within the "INNOVATION" Strategic Goal?

☐	Technology
☐	Planning and Operations
☐	Materials and Assets
☐	Funding and Economics
☐	Organizational and Internal Processes

13. USEFULNESS: Rank the following Innovation Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

	Very Low		Medium		Very High
Technology	◯	◯	◯	◯	◯
Planning and Operations	◯	◯	◯	◯	◯
Materials and Assets	◯	◯	◯	◯	◯
Funding and Economics	◯	◯	◯	◯	◯
Organizational and Internal Processes	◯	◯	◯	◯	◯

14. URGENCY: Rank the following Innovation Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

	Very Low		Medium		Very High
Technology	◯	◯	◯	◯	◯
Planning and Operations	◯	◯	◯	◯	◯
Materials and Assets	◯	◯	◯	◯	◯
Funding and Economics	◯	◯	◯	◯	◯
Organizational and Internal Processes	◯	◯	◯	◯	◯

NDOT Research Strategic Plan Survey

Strategic Goal - Effectively preserve and manage our assets

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

15. Rank the Research Areas within the "EFFECTIVELY PRESERVE AND MANAGE OUR ASSETS" Strategic Goal?

- [ ] Asset Management
- [ ] Asset Preservation
- [ ] Cost and Funding

16. USEFULNESS: Rank the following Asset Management Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

	Very Low		Medium		Very High
Asset Management	◯	◯	◯	◯	◯
Asset Preservation	◯	◯	◯	◯	◯
Cost and Funding	◯	◯	◯	◯	◯

17. URGENCY: Rank the following Asset Management Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

	Very Low		Medium		Very High
Asset Management	◯	◯	◯	◯	◯
Asset Preservation	◯	◯	◯	◯	◯
Cost and Funding	◯	◯	◯	◯	◯

NDOT Research Strategic Plan Survey

Strategic Goal - Effectively operate the transportation system

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

18. Rank the Research Areas within the "EFFECTIVELY OPERATE THE TRANSPORTATION SYSTEM" Strategic Goal?

- [ ] Data Management
- [ ] Maintenance and Operation
- [ ] Integration of all Modes of Transportation
- [ ] System Optimization

19. USEFULNESS: Rank the following Transportation System Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

	Very Low		Medium		Very High
Data Management	◯	◯	◯	◯	◯
Maintenance and Operation	◯	◯	◯	◯	◯
Integration of all Modes of Transportation	◯	◯	◯	◯	◯
System Optimization	◯	◯	◯	◯	◯

20. URGENCY: Rank the following Transportation System Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

	Very Low		Medium		Very High
Data Management	◯	◯	◯	◯	◯
Maintenance and Operation	◯	◯	◯	◯	◯
Integration of all Modes of Transportation	◯	◯	◯	◯	◯
System Optimization	◯	◯	◯	◯	◯

NDOT Research Strategic Plan Survey

Strategic Goal - Be the employer of choice

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

21. Rank the Research Areas within the "BE THE EMPLOYER OF CHOICE" Strategic Goal?

☐	Hiring
☐	Employee Retention
☐	Employee Training
☐	Compensation Package
☐	Work Environment

22. USEFULNESS: Rank the following Employer of Choice Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

	Very Low		Medium		Very High
Hiring	◯	◯	◯	◯	◯
Employee Retention	◯	◯	◯	◯	◯
Employee Training	◯	◯	◯	◯	◯
Compensation Package	◯	◯	◯	◯	◯
Work Environment	◯	◯	◯	◯	◯

23. URGENCY: Rank the following Employer of Choice Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

	Very Low		Medium		Very High
Hiring	◯	◯	◯	◯	◯
Employee Retention	◯	◯	◯	◯	◯
Employee Training	◯	◯	◯	◯	◯
Compensation Package	◯	◯	◯	◯	◯
Work Environment	◯	◯	◯	◯	◯

NDOT Research Strategic Plan Survey

Research Areas

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

24. What should be NDOT's Top 5 priority Research Areas

- [ ] Safety Technology (Optimize Safety)
- [ ] Employee Safety (Optimize Safety)
- [ ] Road User Safety (Optimize Safety)
- [ ] Safety Effectiveness (Optimize Safety)
- [ ] Crash Data/Info (Optimize Safety)
- [ ] Safety Education and Training (Optimize Safety)
- [ ] Involvement with Other Agencies (Customers)
- [ ] Involvement with the General Public (Customers)
- [ ] Project/Program Prioritization and Selection (Project Delivery)
- [ ] Project/Program Evaluation and Effectiveness (Project Delivery)
- [ ] Project/Program Cost and Benefit (Project Delivery)
- [ ] Project/Program Data (Project Delivery)
- [ ] Technology (Innovation)
- [ ] Planning and Operation (Innovation)
- [ ] Materials and Assets (Innovation)
- [ ] Funding and Economics (Innovation)
- [ ] Organizational and Internal Processes (Innovation)
- [ ] Asset Management (Asset Management)
- [ ] Asset Preservation (Asset Management)
- [ ] Cost and Funding (Asset Management)
- [ ] Data Management (Transportation System)
- [ ] Maintenance and Operations (Transportation System)
- [ ] Integration of all Modes of Transportation (Transportation System)
- [ ] System Optimization (Transportation System)
- [ ] Hiring (Employer of Choice)
- [ ] Employee Retention (Employer of Choice)
- [ ] Employee Training (Employer of Choice)
- [ ] Compensation Package (Employer of Choice)

NDOT Research Strategic Plan Survey

- [ ] Work Environment (Employer of Choice)

NDOT Research Strategic Plan Survey

Research Questions

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

25. (Optional) Please provide any addition Research Questions you may have thought of since the workshop. Make sure that your question(s) is(are) in the form of a question.

NDOT Research Strategic Plan Survey

Research Performance Measures

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

26. Should research related Performance Measures be include in NDOT's Research Strategic Plan?

- ◯ Yes
- ◯ No

NDOT Research Strategic Plan Survey

Research Performance Measures

*Please see e-mail attachment for the list of list of NDOT Goals, related Research Areas, and questions developed in the workshops.

27. Rate the quality of the following research related Performance Measures.

	Very Poor	Poor	Neutral	Good	Very Good
Percentage of Research Projects that can be applied to the Strategic Goals	◯	◯	◯	◯	◯
Percentage of research projects that were on schedule and within budget	◯	◯	◯	◯	◯
Percentage of research projects for which benefits can be documented	◯	◯	◯	◯	◯
Quantify how research pays off	◯	◯	◯	◯	◯

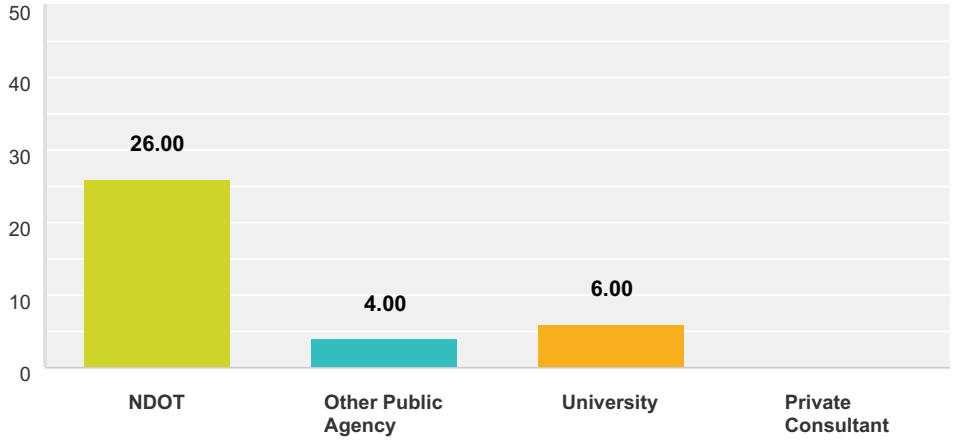
28. (Optional) Provide any additional Performance Measure related to research that should be considered.

APPENDIX D

SURVEY RESULTS

Q1 Which of the following best describes your employer?

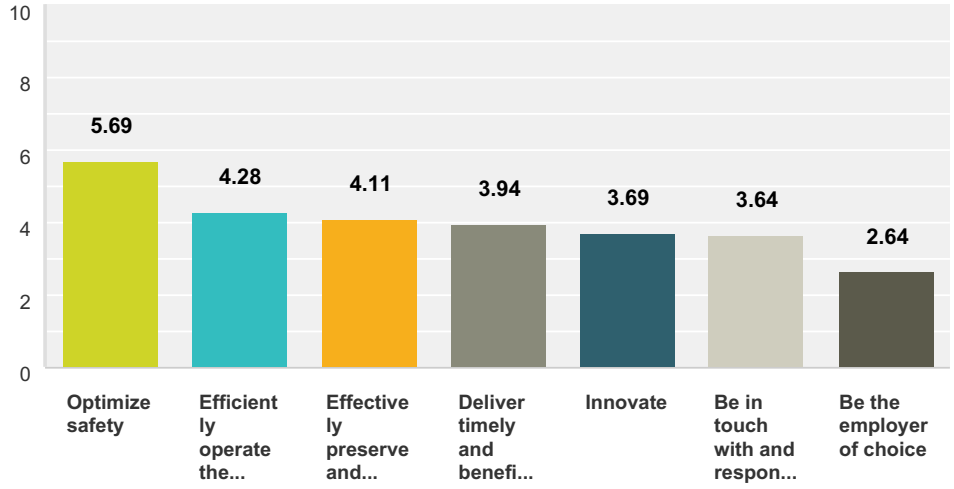
Answered: 36 Skipped: 0



Answer Choices	Responses	
NDOT	**72.22%**	26.00
Other Public Agency	**11.11%**	4.00
University	**16.67%**	6.00
Private Consultant	**0.00%**	0.00
Total		**36**

Q2 Rank the NDOT Strategic Goals in Order of Priority based on Research Needs.

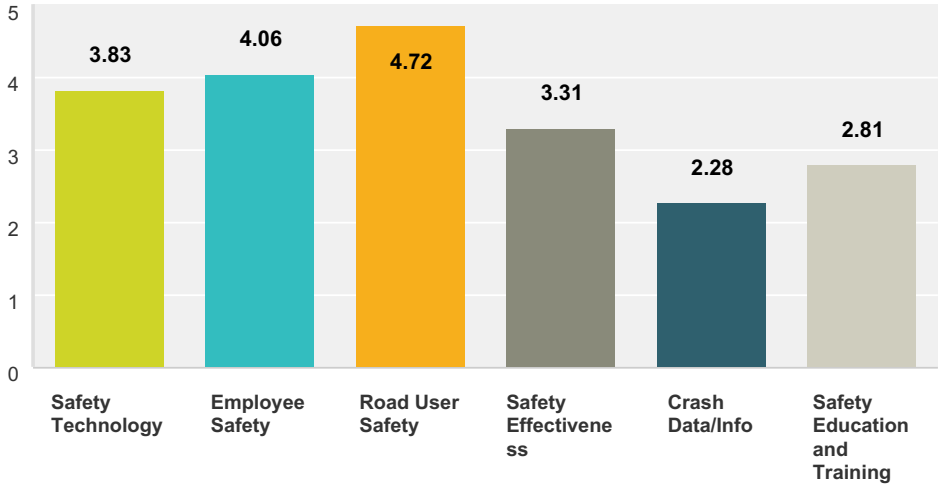
Answered: 36 Skipped: 0



	1	2	3	4	5	6	7	Total	Average Ranking
Optimize safety	**52.78%** 19.00	**16.67%** 6.00	**5.56%** 2.00	**8.33%** 3.00	**5.56%** 2.00	**11.11%** 4.00	**0.00%** 0.00	36	5.69
Efficiently operate the transportation system	**11.11%** 4.00	**22.22%** 8.00	**16.67%** 6.00	**13.89%** 5.00	**13.89%** 5.00	**13.89%** 5.00	**8.33%** 3.00	36	4.28
Effectively preserve and manage our assets	**8.33%** 3.00	**25.00%** 9.00	**13.89%** 5.00	**16.67%** 6.00	**5.56%** 2.00	**19.44%** 7.00	**11.11%** 4.00	36	4.11
Deliver timely and beneficial projects and programs	**2.78%** 1.00	**8.33%** 3.00	**27.78%** 10.00	**22.22%** 8.00	**25.00%** 9.00	**8.33%** 3.00	**5.56%** 2.00	36	3.94
Innovate	**8.33%** 3.00	**11.11%** 4.00	**16.67%** 6.00	**16.67%** 6.00	**11.11%** 4.00	**25.00%** 9.00	**11.11%** 4.00	36	3.69
Be in touch with and responsive to our customers	**2.78%** 1.00	**11.11%** 4.00	**16.67%** 6.00	**16.67%** 6.00	**27.78%** 10.00	**19.44%** 7.00	**5.56%** 2.00	36	3.64
Be the employer of choice	**13.89%** 5.00	**5.56%** 2.00	**2.78%** 1.00	**5.56%** 2.00	**11.11%** 4.00	**2.78%** 1.00	**58.33%** 21.00	36	2.64

Q3 Rank the Research Areas within the "OPTIMIZE SAFETY" Strategic Goal?

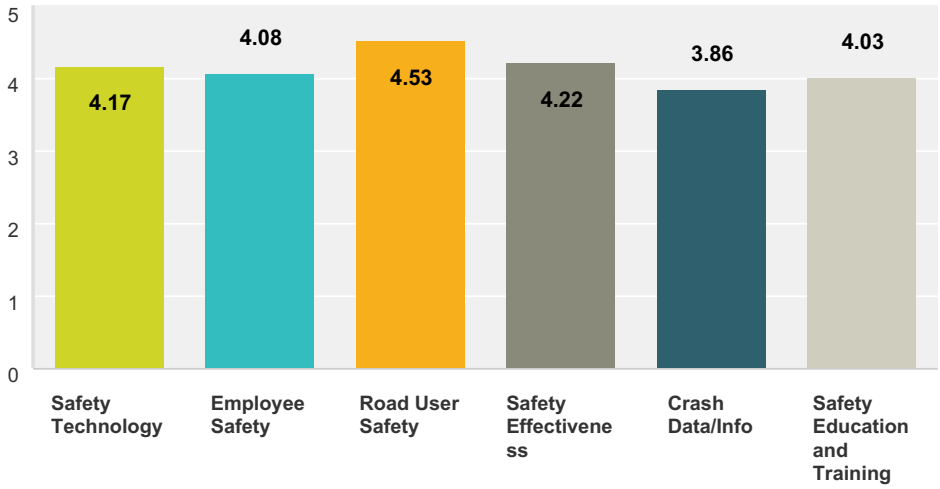
Answered: 36 Skipped: 0



	1	2	3	4	5	6	Total	Average Ranking
Safety Technology	**5.56%** 2.00	**27.78%** 10.00	**27.78%** 10.00	**25.00%** 9.00	**11.11%** 4.00	**2.78%** 1.00	36	3.83
Employee Safety	**30.56%** 11.00	**19.44%** 7.00	**8.33%** 3.00	**16.67%** 6.00	**16.67%** 6.00	**8.33%** 3.00	36	4.06
Road User Safety	**36.11%** 13.00	**27.78%** 10.00	**16.67%** 6.00	**11.11%** 4.00	**8.33%** 3.00	**0.00%** 0.00	36	4.72
Safety Effectiveness	**13.89%** 5.00	**5.56%** 2.00	**19.44%** 7.00	**30.56%** 11.00	**19.44%** 7.00	**11.11%** 4.00	36	3.31
Crash Data/Info	**11.11%** 4.00	**2.78%** 1.00	**8.33%** 3.00	**5.56%** 2.00	**25.00%** 9.00	**47.22%** 17.00	36	2.28
Safety Education and Training	**2.78%** 1.00	**16.67%** 6.00	**19.44%** 7.00	**11.11%** 4.00	**19.44%** 7.00	**30.56%** 11.00	36	2.81

Q4 USEFULNESS: Rank the following Safety Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

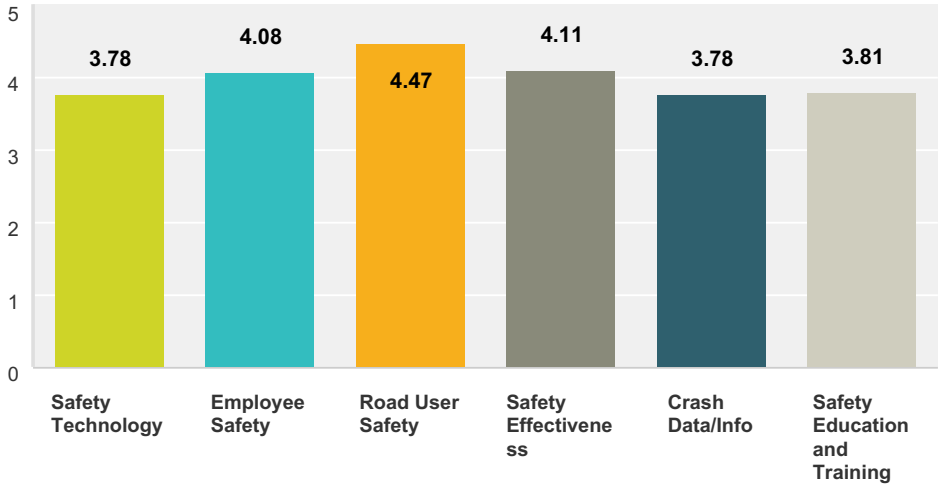
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Safety Technology	0.00% 0.00	5.56% 2.00	13.89% 5.00	38.89% 14.00	41.67% 15.00	36	4.17
Employee Safety	0.00% 0.00	13.89% 5.00	16.67% 6.00	16.67% 6.00	52.78% 19.00	36	4.08
Road User Safety	0.00% 0.00	2.78% 1.00	11.11% 4.00	16.67% 6.00	69.44% 25.00	36	4.53
Safety Effectiveness	0.00% 0.00	0.00% 0.00	16.67% 6.00	44.44% 16.00	38.89% 14.00	36	4.22
Crash Data/Info	0.00% 0.00	5.56% 2.00	27.78% 10.00	41.67% 15.00	25.00% 9.00	36	3.86
Safety Education and Training	0.00% 0.00	19.44% 7.00	8.33% 3.00	22.22% 8.00	50.00% 18.00	36	4.03

Q5 URGENCY: Rank the following Safety Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

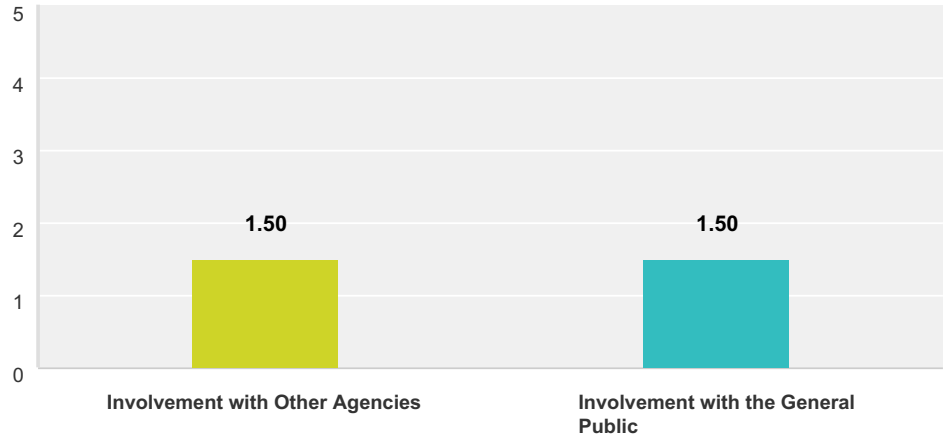
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Safety Technology	**5.56%** 2.00	**2.78%** 1.00	**30.56%** 11.00	**30.56%** 11.00	**30.56%** 11.00	36	3.78
Employee Safety	**5.56%** 2.00	**11.11%** 4.00	**5.56%** 2.00	**25.00%** 9.00	**52.78%** 19.00	36	4.08
Road User Safety	**0.00%** 0.00	**2.78%** 1.00	**13.89%** 5.00	**16.67%** 6.00	**66.67%** 24.00	36	4.47
Safety Effectiveness	**2.78%** 1.00	**0.00%** 0.00	**22.22%** 8.00	**33.33%** 12.00	**41.67%** 15.00	36	4.11
Crash Data/Info	**0.00%** 0.00	**11.11%** 4.00	**30.56%** 11.00	**27.78%** 10.00	**30.56%** 11.00	36	3.78
Safety Education and Training	**8.33%** 3.00	**8.33%** 3.00	**22.22%** 8.00	**16.67%** 6.00	**44.44%** 16.00	36	3.81

Q6 Rank the Research Areas within the "BE IN TOUCH WITH AND RESPONSIVE TO CUSTOMERS" Strategic Goal?

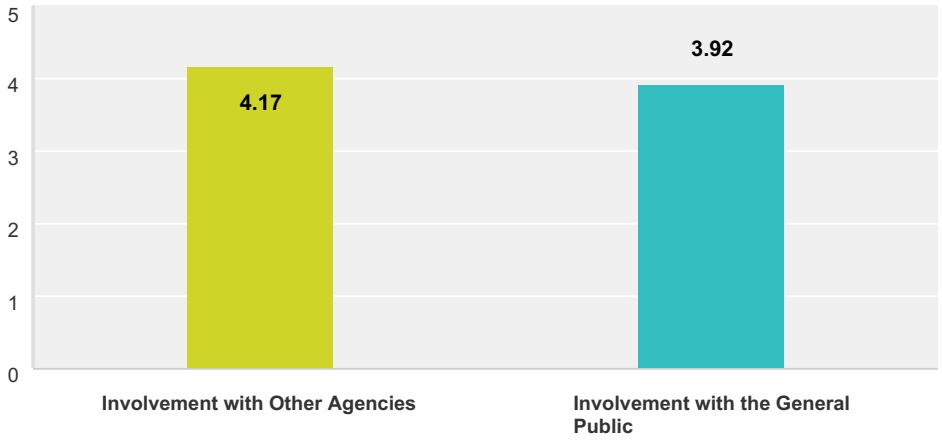
Answered: 36 Skipped: 0



	1	2	Total	Average Ranking
Involvement with Other Agencies	**50.00%** 18.00	**50.00%** 18.00	36	1.50
Involvement with the General Public	**50.00%** 18.00	**50.00%** 18.00	36	1.50

Q7 USEFULNESS: Rank the following Customer Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

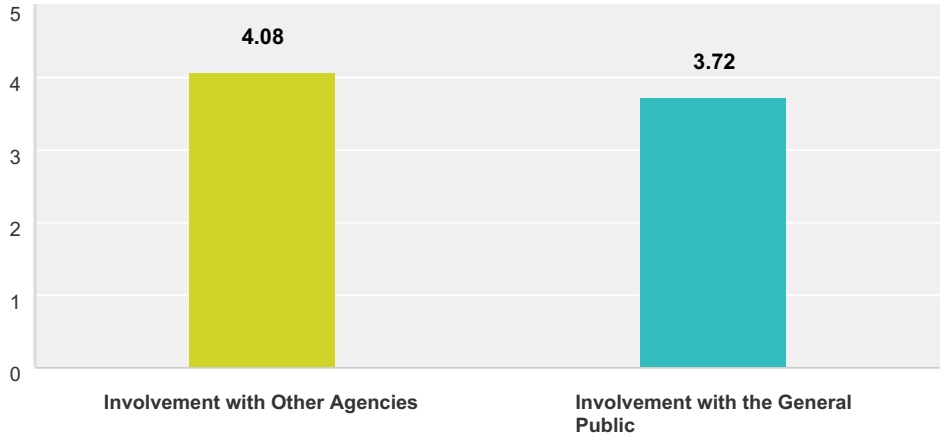
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Involvement with Other Agencies	**2.78%** 1.00	**5.56%** 2.00	**11.11%** 4.00	**33.33%** 12.00	**47.22%** 17.00	36	4.17
Involvement with the General Public	**2.78%** 1.00	**5.56%** 2.00	**30.56%** 11.00	**19.44%** 7.00	**41.67%** 15.00	36	3.92

Q8 URGENCY: Rank the following Customer Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

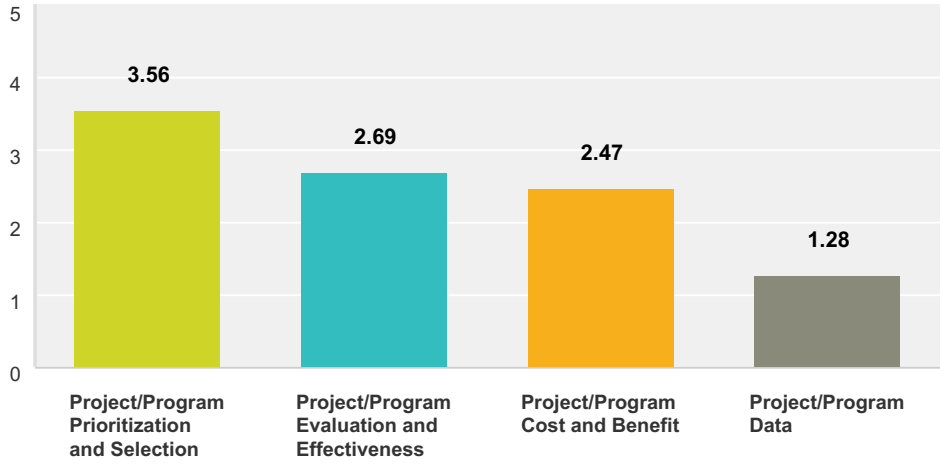
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Involvement with Other Agencies	**5.56%** 2.00	**0.00%** 0.00	**16.67%** 6.00	**36.11%** 13.00	**41.67%** 15.00	36	4.08
Involvement with the General Public	**5.56%** 2.00	**8.33%** 3.00	**25.00%** 9.00	**30.56%** 11.00	**30.56%** 11.00	36	3.72

Q9 Rank the Research Areas within the "DELIVER TIMELY AND BENEFICIAL PROJECTS AND PROGRAMS" Strategic Goal?

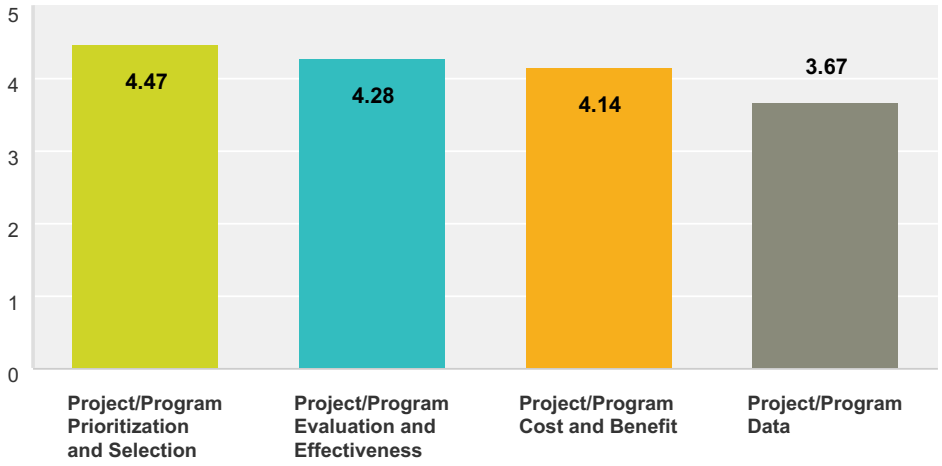
Answered: 36 Skipped: 0



	1	2	3	4	Total	Average Ranking
Project/Program Prioritization and Selection	**72.22%** 26.00	**13.89%** 5.00	**11.11%** 4.00	**2.78%** 1.00	36	3.56
Project/Program Evaluation and Effectiveness	**5.56%** 2.00	**61.11%** 22.00	**30.56%** 11.00	**2.78%** 1.00	36	2.69
Project/Program Cost and Benefit	**16.67%** 6.00	**22.22%** 8.00	**52.78%** 19.00	**8.33%** 3.00	36	2.47
Project/Program Data	**5.56%** 2.00	**2.78%** 1.00	**5.56%** 2.00	**86.11%** 31.00	36	1.28

Q10 USEFULNESS: Rank the following Project Delivery Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

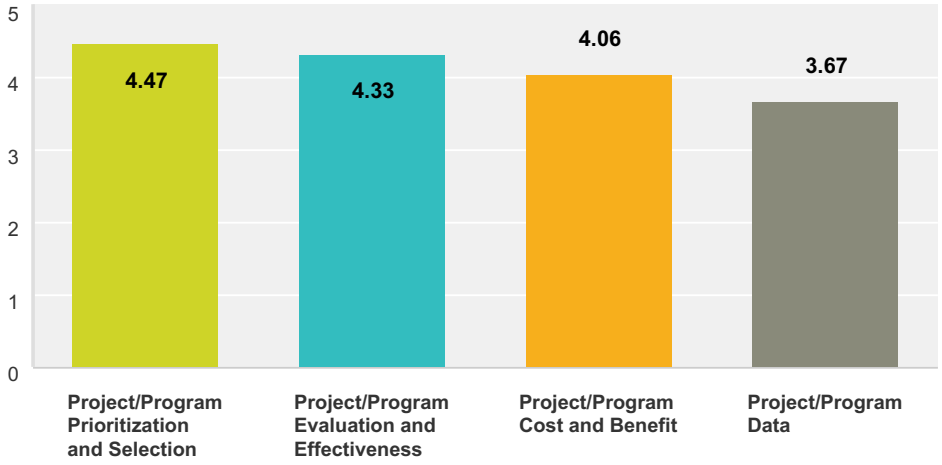
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Project/Program Prioritization and Selection	**0.00%** 0.00	**0.00%** 0.00	**11.11%** 4.00	**30.56%** 11.00	**58.33%** 21.00	36	4.47
Project/Program Evaluation and Effectiveness	**0.00%** 0.00	**0.00%** 0.00	**11.11%** 4.00	**50.00%** 18.00	**38.89%** 14.00	36	4.28
Project/Program Cost and Benefit	**0.00%** 0.00	**2.78%** 1.00	**19.44%** 7.00	**38.89%** 14.00	**38.89%** 14.00	36	4.14
Project/Program Data	**0.00%** 0.00	**5.56%** 2.00	**44.44%** 16.00	**27.78%** 10.00	**22.22%** 8.00	36	3.67

Q11 URGENCY: Rank the following Project Delivery Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

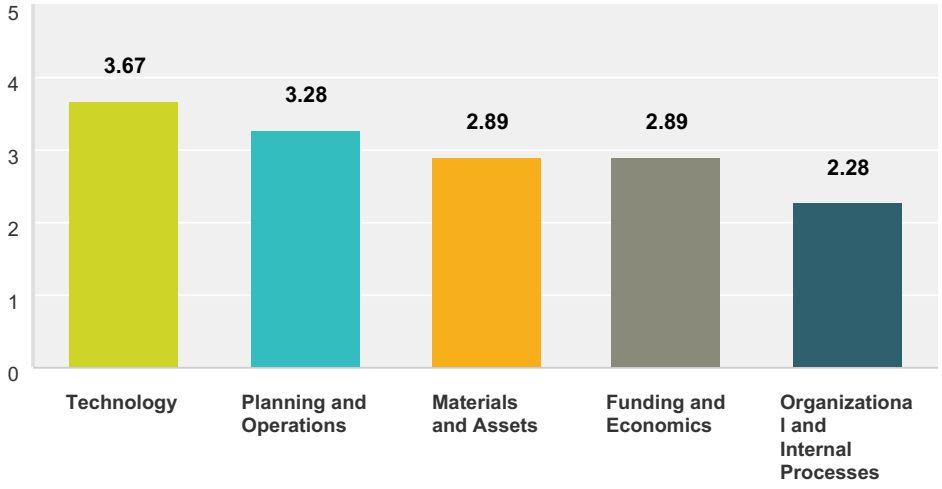
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Project/Program Prioritization and Selection	**0.00%** 0.00	**0.00%** 0.00	**13.89%** 5.00	**25.00%** 9.00	**61.11%** 22.00	36	4.47
Project/Program Evaluation and Effectiveness	**0.00%** 0.00	**0.00%** 0.00	**8.33%** 3.00	**50.00%** 18.00	**41.67%** 15.00	36	4.33
Project/Program Cost and Benefit	**0.00%** 0.00	**8.33%** 3.00	**13.89%** 5.00	**41.67%** 15.00	**36.11%** 13.00	36	4.06
Project/Program Data	**0.00%** 0.00	**5.56%** 2.00	**44.44%** 16.00	**27.78%** 10.00	**22.22%** 8.00	36	3.67

Q12 Rank the Research Areas within the "INNOVATION" Strategic Goal?

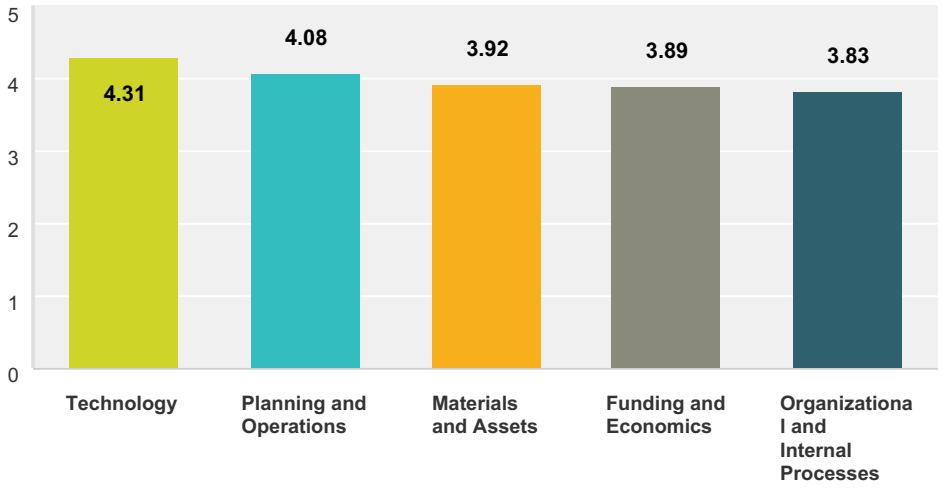
Answered: 36 Skipped: 0



	1	2	3	4	5	Total	Average Ranking
Technology	**36.11%** 13.00	**27.78%** 10.00	**13.89%** 5.00	**11.11%** 4.00	**11.11%** 4.00	36	3.67
Planning and Operations	**13.89%** 5.00	**33.33%** 12.00	**27.78%** 10.00	**16.67%** 6.00	**8.33%** 3.00	36	3.28
Materials and Assets	**19.44%** 7.00	**11.11%** 4.00	**25.00%** 9.00	**27.78%** 10.00	**16.67%** 6.00	36	2.89
Funding and Economics	**19.44%** 7.00	**11.11%** 4.00	**22.22%** 8.00	**33.33%** 12.00	**13.89%** 5.00	36	2.89
Organizational and Internal Processes	**11.11%** 4.00	**16.67%** 6.00	**11.11%** 4.00	**11.11%** 4.00	**50.00%** 18.00	36	2.28

Q13 USEFULNESS: Rank the following Innovation Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

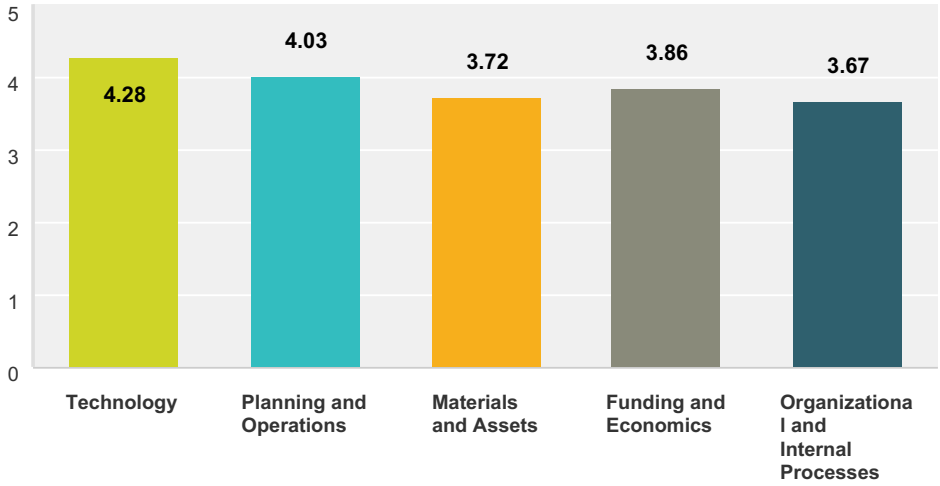
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Technology	**0.00%** 0.00	**2.78%** 1.00	**16.67%** 6.00	**27.78%** 10.00	**52.78%** 19.00	36	4.31
Planning and Operations	**0.00%** 0.00	**2.78%** 1.00	**19.44%** 7.00	**44.44%** 16.00	**33.33%** 12.00	36	4.08
Materials and Assets	**2.78%** 1.00	**5.56%** 2.00	**25.00%** 9.00	**30.56%** 11.00	**36.11%** 13.00	36	3.92
Funding and Economics	**2.78%** 1.00	**11.11%** 4.00	**19.44%** 7.00	**27.78%** 10.00	**38.89%** 14.00	36	3.89
Organizational and Internal Processes	**0.00%** 0.00	**8.33%** 3.00	**30.56%** 11.00	**30.56%** 11.00	**30.56%** 11.00	36	3.83

Q14 URGENCY: Rank the following Innovation Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

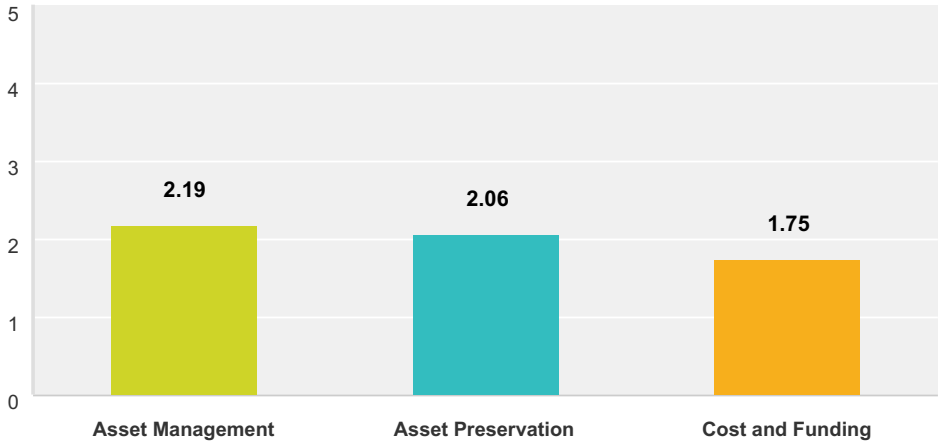
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Technology	**0.00%** 0.00	**2.78%** 1.00	**16.67%** 6.00	**30.56%** 11.00	**50.00%** 18.00	36	4.28
Planning and Operations	**0.00%** 0.00	**8.33%** 3.00	**22.22%** 8.00	**27.78%** 10.00	**41.67%** 15.00	36	4.03
Materials and Assets	**2.78%** 1.00	**8.33%** 3.00	**33.33%** 12.00	**25.00%** 9.00	**30.56%** 11.00	36	3.72
Funding and Economics	**2.78%** 1.00	**11.11%** 4.00	**22.22%** 8.00	**25.00%** 9.00	**38.89%** 14.00	36	3.86
Organizational and Internal Processes	**5.56%** 2.00	**11.11%** 4.00	**27.78%** 10.00	**22.22%** 8.00	**33.33%** 12.00	36	3.67

Q15 Rank the Research Areas within the "EFFECTIVELY PRESERVE AND MANAGE OUR ASSETS" Strategic Goal?

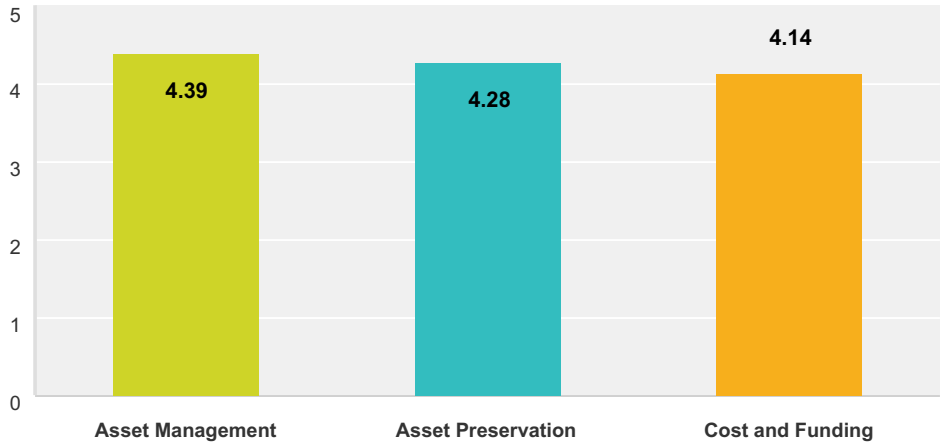
Answered: 36 Skipped: 0



	1	2	3	Total	Average Ranking
Asset Management	**41.67%** 15.00	**36.11%** 13.00	**22.22%** 8.00	36	2.19
Asset Preservation	**30.56%** 11.00	**44.44%** 16.00	**25.00%** 9.00	36	2.06
Cost and Funding	**27.78%** 10.00	**19.44%** 7.00	**52.78%** 19.00	36	1.75

Q16 USEFULNESS: Rank the following Asset Management Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

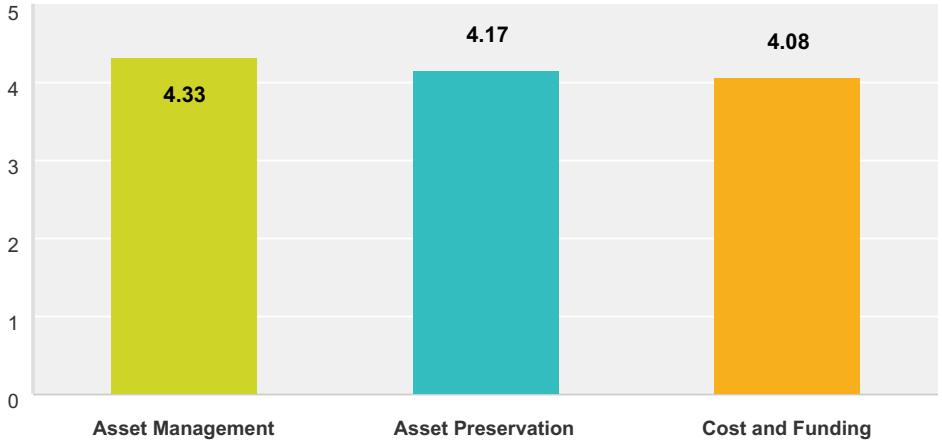
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Asset Management	**0.00%** 0.00	**5.56%** 2.00	**8.33%** 3.00	**27.78%** 10.00	**58.33%** 21.00	36	4.39
Asset Preservation	**0.00%** 0.00	**2.78%** 1.00	**16.67%** 6.00	**30.56%** 11.00	**50.00%** 18.00	36	4.28
Cost and Funding	**2.78%** 1.00	**0.00%** 0.00	**27.78%** 10.00	**19.44%** 7.00	**50.00%** 18.00	36	4.14

Q17 URGENCY: Rank the following Asset Management Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

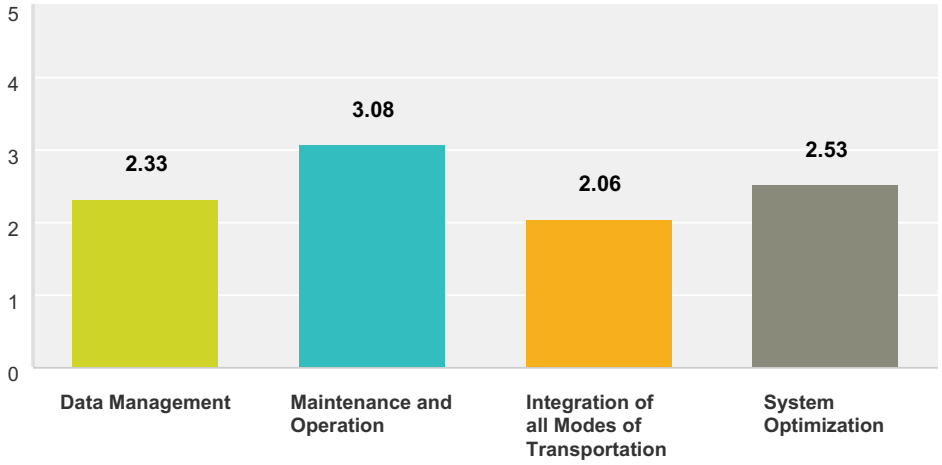
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Asset Management	**0.00%** 0.00	**0.00%** 0.00	**16.67%** 6.00	**33.33%** 12.00	**50.00%** 18.00	36	4.33
Asset Preservation	**0.00%** 0.00	**0.00%** 0.00	**25.00%** 9.00	**33.33%** 12.00	**41.67%** 15.00	36	4.17
Cost and Funding	**2.78%** 1.00	**0.00%** 0.00	**27.78%** 10.00	**25.00%** 9.00	**44.44%** 16.00	36	4.08

Q18 Rank the Research Areas within the "EFFECTIVELY OPERATE THE TRANSPORTATION SYSTEM" Strategic Goal?

Answered: 36 Skipped: 0



	1	2	3	4	Total	Average Ranking
Data Management	**19.44%** 7.00	**25.00%** 9.00	**25.00%** 9.00	**30.56%** 11.00	36	2.33
Maintenance and Operation	**41.67%** 15.00	**25.00%** 9.00	**33.33%** 12.00	**0.00%** 0.00	36	3.08
Integration of all Modes of Transportation	**19.44%** 7.00	**11.11%** 4.00	**25.00%** 9.00	**44.44%** 16.00	36	2.06
System Optimization	**19.44%** 7.00	**38.89%** 14.00	**16.67%** 6.00	**25.00%** 9.00	36	2.53

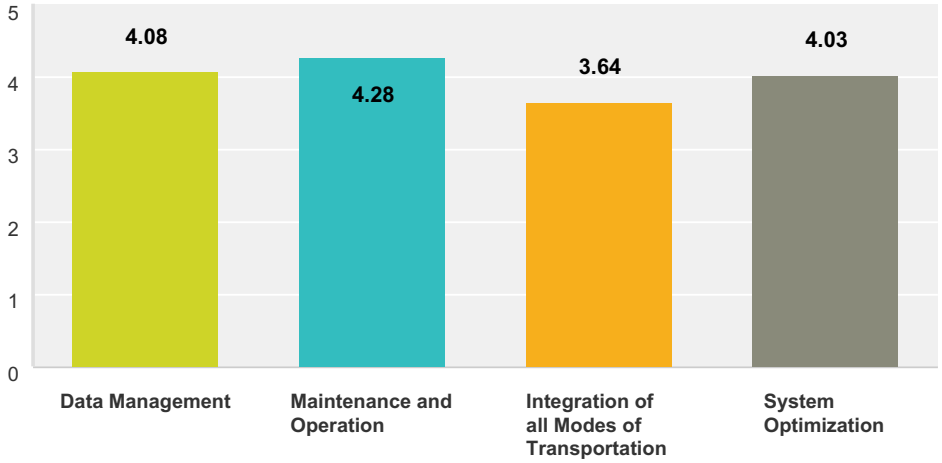
Q19 USEFULNESS: Rank the following Transportation System Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

Answered: 36 Skipped: 0

	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Data Management	**2.78%** 1.00	**2.78%** 1.00	**16.67%** 6.00	**47.22%** 17.00	**30.56%** 11.00	36	4.00
Maintenance and Operation	**2.78%** 1.00	**0.00%** 0.00	**13.89%** 5.00	**25.00%** 9.00	**58.33%** 21.00	36	4.36
Integration of all Modes of Transportation	**5.56%** 2.00	**2.78%** 1.00	**36.11%** 13.00	**25.00%** 9.00	**30.56%** 11.00	36	3.72
System Optimization	**0.00%** 0.00	**0.00%** 0.00	**25.00%** 9.00	**30.56%** 11.00	**44.44%** 16.00	36	4.19

Q20 URGENCY: Rank the following Transportation System Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

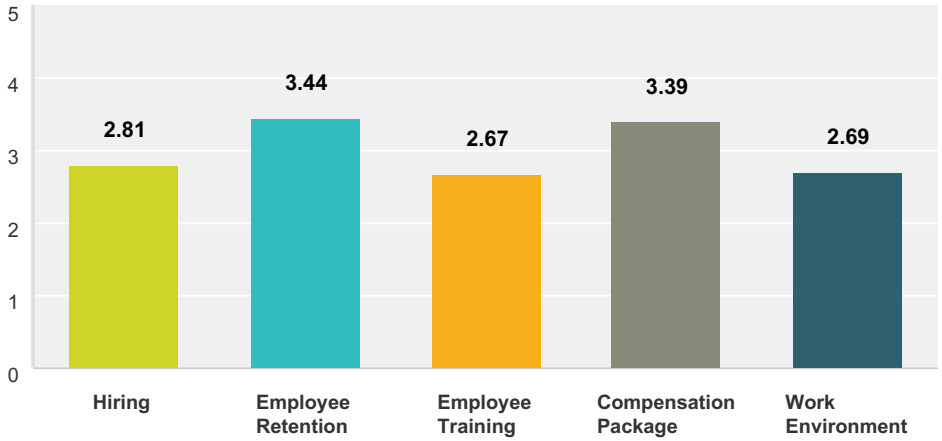
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Data Management	**0.00%** 0.00	**5.56%** 2.00	**16.67%** 6.00	**41.67%** 15.00	**36.11%** 13.00	36	4.08
Maintenance and Operation	**0.00%** 0.00	**2.78%** 1.00	**16.67%** 6.00	**30.56%** 11.00	**50.00%** 18.00	36	4.28
Integration of all Modes of Transportation	**5.56%** 2.00	**5.56%** 2.00	**30.56%** 11.00	**36.11%** 13.00	**22.22%** 8.00	36	3.64
System Optimization	**0.00%** 0.00	**5.56%** 2.00	**16.67%** 6.00	**47.22%** 17.00	**30.56%** 11.00	36	4.03

Q21 Rank the Research Areas within the "BE THE EMPLOYER OF CHOICE" Strategic Goal?

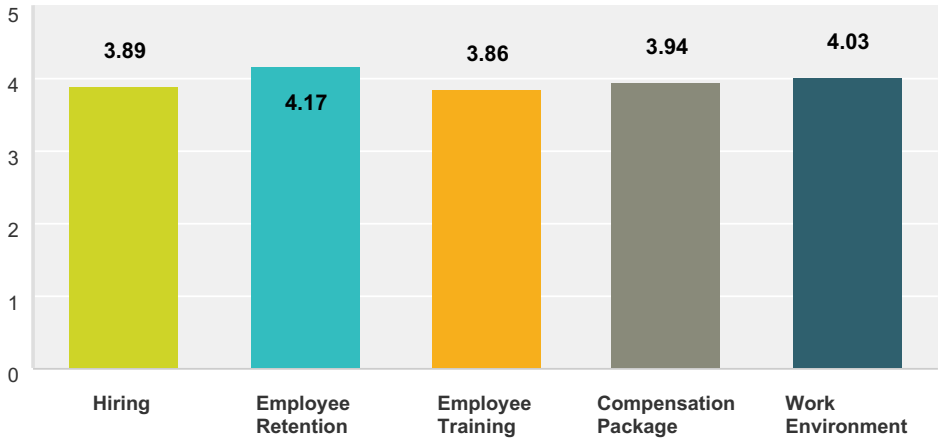
Answered: 36 Skipped: 0



	1	2	3	4	5	Total	Average Ranking
Hiring	**16.67%** 6.00	**13.89%** 5.00	**25.00%** 9.00	**22.22%** 8.00	**22.22%** 8.00	36	2.81
Employee Retention	**25.00%** 9.00	**27.78%** 10.00	**19.44%** 7.00	**22.22%** 8.00	**5.56%** 2.00	36	3.44
Employee Training	**11.11%** 4.00	**11.11%** 4.00	**30.56%** 11.00	**27.78%** 10.00	**19.44%** 7.00	36	2.67
Compensation Package	**33.33%** 12.00	**22.22%** 8.00	**11.11%** 4.00	**16.67%** 6.00	**16.67%** 6.00	36	3.39
Work Environment	**13.89%** 5.00	**25.00%** 9.00	**13.89%** 5.00	**11.11%** 4.00	**36.11%** 13.00	36	2.69

Q22 USEFULNESS: Rank the following Employer of Choice Research Areas with respect to USEFULNESS. (i.e., How important or relevant is the Research Area is with respect to NDOT working towards their Strategic Goals?)

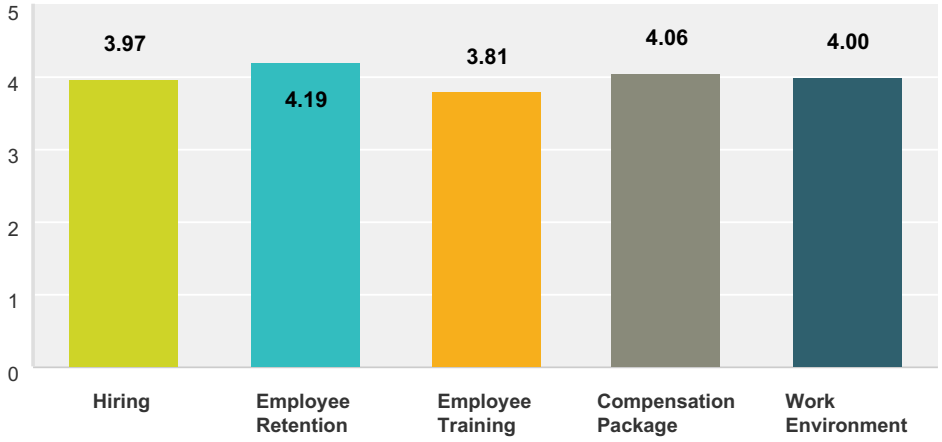
Answered: 36 Skipped: 0



	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Hiring	**2.78%** 1.00	**8.33%** 3.00	**25.00%** 9.00	**25.00%** 9.00	**38.89%** 14.00	36	3.89
Employee Retention	**5.56%** 2.00	**2.78%** 1.00	**16.67%** 6.00	**19.44%** 7.00	**55.56%** 20.00	36	4.17
Employee Training	**2.78%** 1.00	**5.56%** 2.00	**30.56%** 11.00	**25.00%** 9.00	**36.11%** 13.00	36	3.86
Compensation Package	**8.33%** 3.00	**2.78%** 1.00	**16.67%** 6.00	**30.56%** 11.00	**41.67%** 15.00	36	3.94
Work Environment	**5.56%** 2.00	**0.00%** 0.00	**27.78%** 10.00	**19.44%** 7.00	**47.22%** 17.00	36	4.03

Q23 URGENCY: Rank the following Employer of Choice Research Areas with respect to URGENCY. (i.e., How crucial or imperative is it that this Research Area be addressed?)

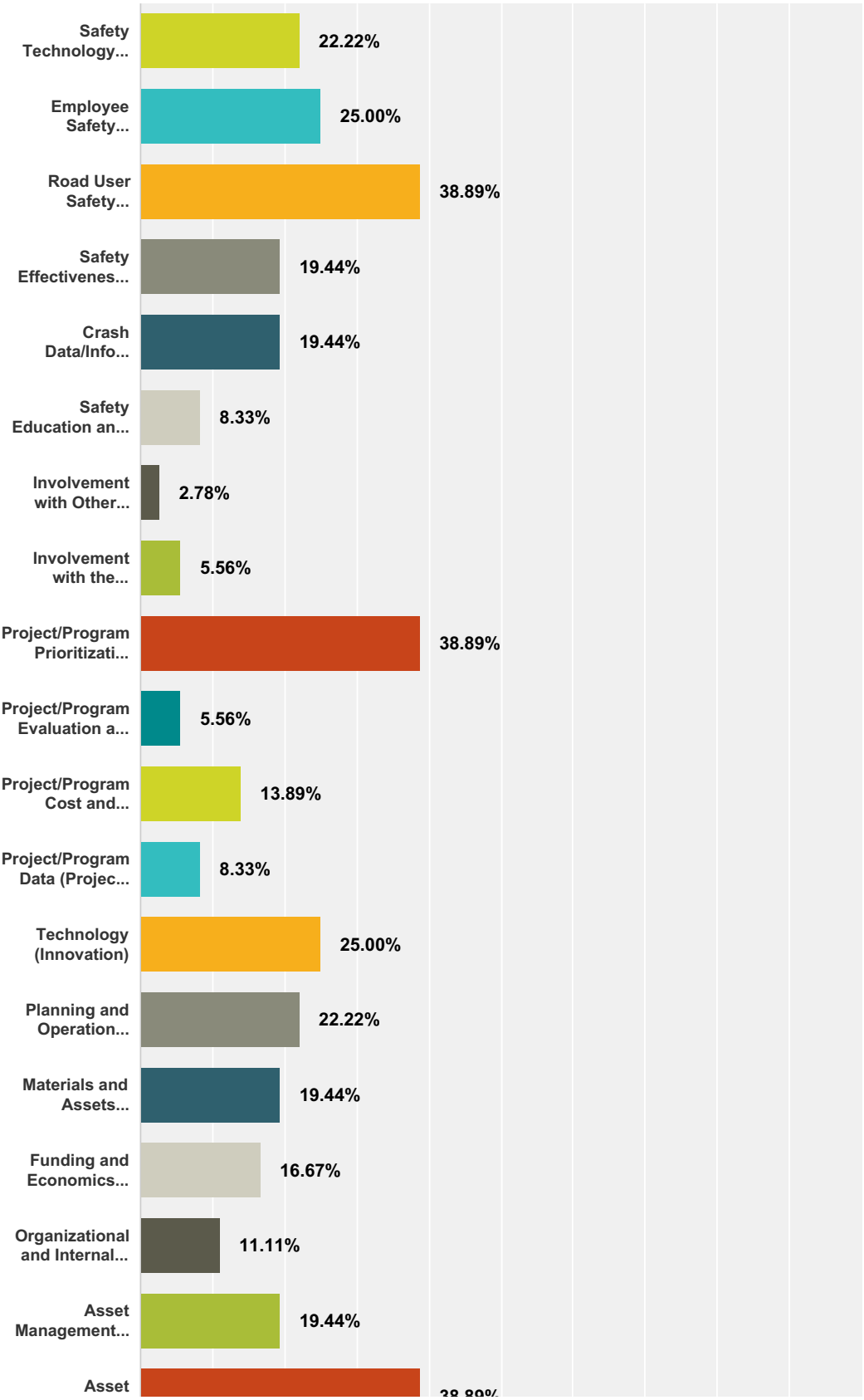
Answered: 36 Skipped: 0

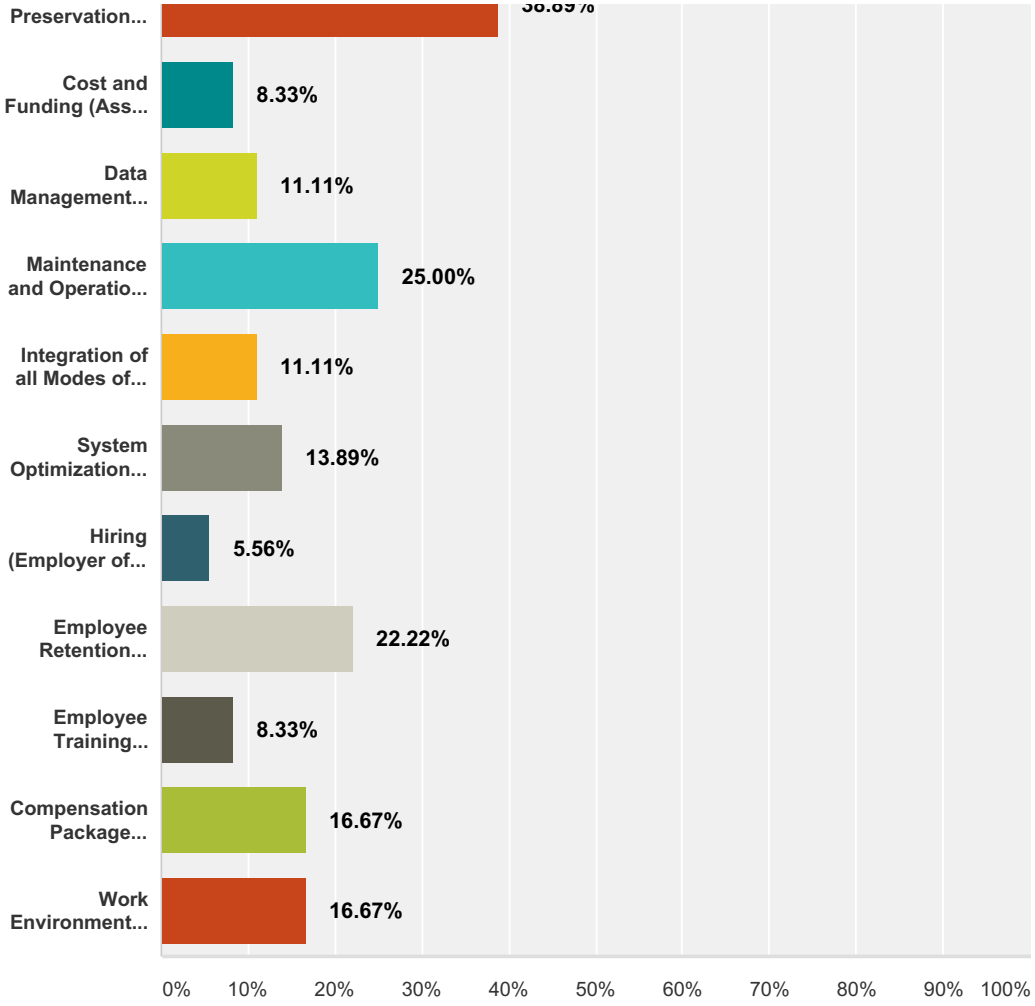


	Very Low	(no label)	Medium	(no label)	Very High	Total	Average Rating
Hiring	**5.56%** 2.00	**5.56%** 2.00	**22.22%** 8.00	**19.44%** 7.00	**47.22%** 17.00	36	3.97
Employee Retention	**5.56%** 2.00	**2.78%** 1.00	**13.89%** 5.00	**22.22%** 8.00	**55.56%** 20.00	36	4.19
Employee Training	**8.33%** 3.00	**2.78%** 1.00	**25.00%** 9.00	**27.78%** 10.00	**36.11%** 13.00	36	3.81
Compensation Package	**11.11%** 4.00	**0.00%** 0.00	**13.89%** 5.00	**22.22%** 8.00	**52.78%** 19.00	36	4.06
Work Environment	**2.78%** 1.00	**2.78%** 1.00	**25.00%** 9.00	**30.56%** 11.00	**38.89%** 14.00	36	4.00

Q24 What should be NDOT's Top 5 priority Research Areas

Answered: 36 Skipped: 0





Answer Choices	Responses	
Safety Technology (Optimize Safety)	**22.22%**	8.00
Employee Safety (Optimize Safety)	**25.00%**	9.00
Road User Safety (Optimize Safety)	**38.89%**	14.00
Safety Effectiveness (Optimize Safety)	**19.44%**	7.00
Crash Data/Info (Optimize Safety)	**19.44%**	7.00
Safety Education and Training (Optimize Safety)	**8.33%**	3.00
Involvement with Other Agencies (Customers)	**2.78%**	1.00
Involvement with the General Public (Customers)	**5.56%**	2.00
Project/Program Prioritization and Selection (Project Delivery)	**38.89%**	14.00
Project/Program Evaluation and Effectiveness (Project Delivery)	**5.56%**	2.00
Project/Program Cost and Benefit (Project Delivery)	**13.89%**	5.00
Project/Program Data (Project Delivery)	**8.33%**	3.00

Technology (Innovation)	**25.00%**	9.00
Planning and Operation (Innovation)	**22.22%**	8.00
Materials and Assets (Innovation)	**19.44%**	7.00
Funding and Economics (Innovation)	**16.67%**	6.00
Organizational and Internal Processes (Innovation)	**11.11%**	4.00
Asset Management (Asset Management)	**19.44%**	7.00
Asset Preservation (Asset Management)	**38.89%**	14.00
Cost and Funding (Asset Management)	**8.33%**	3.00
Data Management (Transportation System)	**11.11%**	4.00
Maintenance and Operations (Transportation System)	**25.00%**	9.00
Integration of all Modes of Transportation (Transportation System)	**11.11%**	4.00
System Optimization (Transportation System)	**13.89%**	5.00
Hiring (Employer of Choice)	**5.56%**	2.00
Employee Retention (Employer of Choice)	**22.22%**	8.00
Employee Training (Employer of Choice)	**8.33%**	3.00
Compensation Package (Employer of Choice)	**16.67%**	6.00
Work Environment (Employer of Choice)	**16.67%**	6.00
Total Respondents: 36		

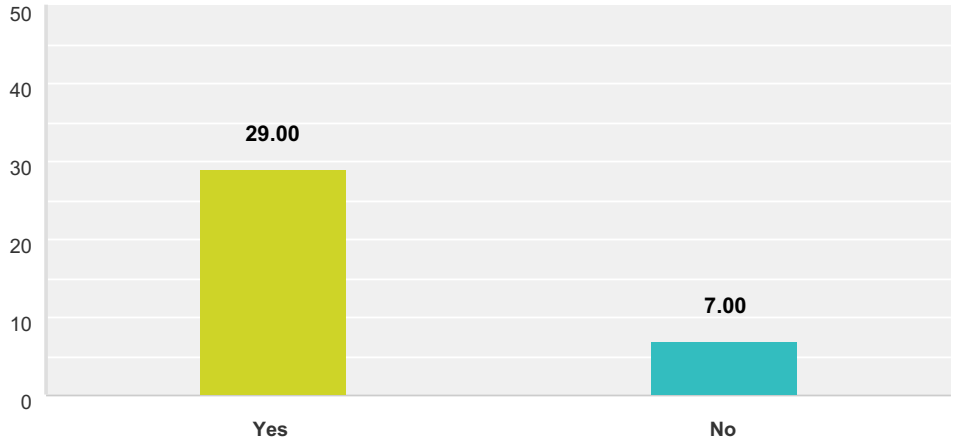
Q25 (Optional) Please provide any addition Research Questions you may have thought of since the workshop. Make sure that your question(s) is(are) in the form of a question.

Answered: 6 Skipped: 30

#	Responses	Date
1	Should we develop other ways to fund innovate projects?	10/15/2014 8:25 PM
2	Accident data has always been for many years Not accurate and timely. Priority should be to make accident data accurate.	10/15/2014 7:57 AM
3	What are the Cost and Schedule Performance of Constructed Projects?	10/9/2014 2:11 PM
4	What can we do to improve freight movement and economic vitality?	10/6/2014 2:17 PM
5	none that I can think of...	10/3/2014 4:12 PM
6	Why is this project being done by a consultant? Don't we know how to send out a survey?	10/3/2014 1:44 PM

Q26 Should research related Performance Measures be include in NDOT's Research Strategic Plan?

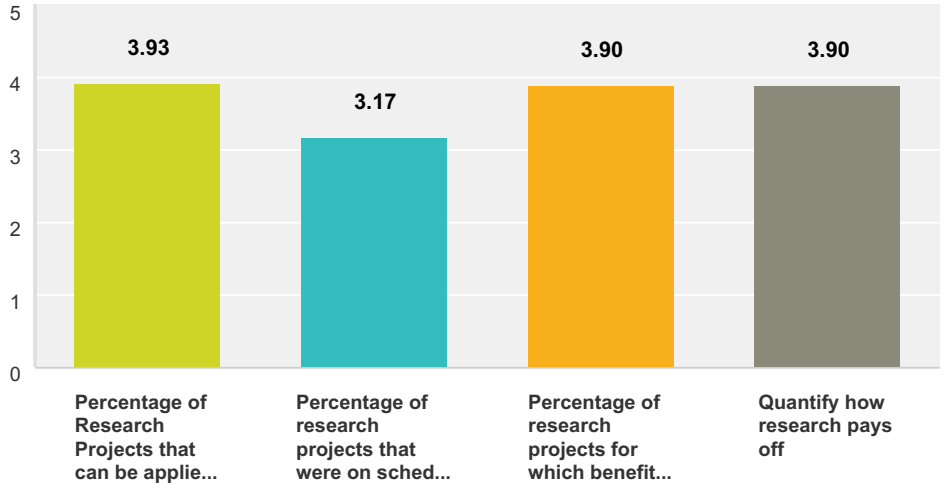
Answered: 36 Skipped: 0



Answer Choices	Responses	
Yes	**80.56%**	29.00
No	**19.44%**	7.00
Total		**36**

Q27 Rate the quality of the following research related Performance Measures.

Answered: 29 Skipped: 7



	Very Poor	Poor	Neutral	Good	Very Good	Total
Percentage of Research Projects that can be applied to the Strategic Goals	**0.00%** 0.00	**3.45%** 1.00	**27.59%** 8.00	**41.38%** 12.00	**27.59%** 8.00	29
Percentage of research projects that were on schedule and within budget	**6.90%** 2.00	**10.34%** 3.00	**51.72%** 15.00	**20.69%** 6.00	**10.34%** 3.00	29
Percentage of research projects for which benefits can be documented	**0.00%** 0.00	**10.34%** 3.00	**27.59%** 8.00	**24.14%** 7.00	**37.93%** 11.00	29
Quantify how research pays off	**0.00%** 0.00	**0.00%** 0.00	**37.93%** 11.00	**34.48%** 10.00	**27.59%** 8.00	29

Q28 (Optional) Provide any additional Performance Measure related to research that should be considered.

Answered: 1 Skipped: 35

#	Responses	Date
1	Percentage of research projects that can be applied to national goals	10/6/2014 2:21 PM

APPENDIX E

TOP PRIORITY RESEARCH AREAS AND QUESTIONS

SUMMARY OF TOP PRIORITY RESEARCH AREA QUESTIONS

Optimize Safety

- **Safety Technology (S1)**
  - What tools, technologies, and policies should be implemented to improve administrative, engineering, or on-site safety controls?
  - How do we make the innovative safety technologies available today a reality on all cars in a shorter timeframe?
  - How to utilize the latest technological developments to improve existing safety practices in Nevada?
- **Employee Safety (S2)**
  - What can be done to improve safety for NDOT employees?
  - How does the State of Nevada compare to other states with workers' comp costs and inquires? What are some ideas to improve in this area?
  - How to improve worker and public safety during construction and maintenance operations in a freeway environment?
  - How do we improve worker and public safety in work zones?
  - What should we be doing for fleet replacement and rebuild from an employee safety perspective?
- **Road User Safety (S3)**
  - What design features and construction standards can be utilized to improve highway safety?
  - Are the current clear zone standards used by NDOT sufficient for today's vehicle speeds and impaired/distracted drivers?
  - How can we improve transit safety and get people to more fully use transit?
  - How do we improve safety for all road users, including pedestrians, bicyclists, transit stops, etc.?
  - What should our asset preservation strategy be in order to provide an acceptable level of safety for our clients?
  - How to achieve multi-agency cooperation to improve traffic safety in Nevada?
  - How to enable the implementation of the Highway Safety Manual?
  - Which methods of the "fast repair" can be used to improve the safety of the roadways?
  - How do we balance competing safety objectives?
  - What processes can be utilized to optimize all components of safety?
  - What is the impact of driverless vehicles on safety?
- **Safety Effectiveness (S4)**
  - What demographic groups in Nevada are not receiving safety messages and how do we best reach this group?
  - How can NDOT implement a before and after study program to determine the effectiveness of safety countermeasures post project?
- **Crash Data/Info (S5)**
  - How can we leverage existing crash data to develop systemic improvements on our roadways?
  - How can we better use our crash data?
  - How to improve the reporting, quality, accuracy, and consistency of crash data?
  - How can we provide crash data quicker?
  - How do we improve data collection of non-vehicular modes?
  - How do we improve the reliability of real-time crash and road information to drivers?
  - How do we improve the integration of crash data and ITS data?
  - Do we need to continue to collect PDO crash data? If so, what are the available methods for collecting this data (i.e., insurance companies)?
- **Safety Education and Training (S6)**

SUMMARY OF TOP PRIORITY RESEARCH AREA QUESTIONS

- How can we educate drivers on traffic technologies?
- How can education (schools, DMV, …) help the State DOT to improve safety?
- What should our maintenance and safety training program look like to maintain the safety and skills we need in our every changing environment?

Be in touch with and responsive to customers

- **Involvement with Other Agencies (C1)**
  - How can customers provide input or response to NDOT's activities and make sure they are heard?
  - How can we stay apprised of what our customers want, need, and desire to attract and retain communities in our State?
  - How do we align ourselves to better meet the needs of our clients and make the transition with the local system more seamless?
  - What are the benefits and costs associated with the Freeway Service Patrol?
  - How can we provide economic growth and tie projects to growth?
  - How can we make it easier for outside agencies to work with NDOT?
  - What are the decision making paths through NDOT for specific projects?
  - How do people know how/who to get answers to specific questions?
  - How can we provide data quicker?
- **Involvement with the General Public (C2)**
  - What can we do to reduce impacts to and better protect the natural and physical environment?
  - What do we want our image to be at NDOT and how do we better market that image to the public?
  - How can we better understand the public's perceived issues and knowledge of the roadways system?
  - How can we develop strategies for improving public knowledge of transportation issues?
  - How can we help the public distinguish between need versus want?
  - What are the best ways to log, and ensure a timely response to public requests?
  - What methods are there for input from Nevadans and/or the public about NDOT's transportation system and services?
  - How can we be more transparent to the public to provide them the information they want?
  - Are there best practices for NDOT to communicate with the public about project benefits?
  - Which methods can be used to rank the customer's needs based on their priorities?
  - What is the impact of electric vehicles and the ability to provide services to the public to support these vehicles?

Innovation

- **Technology (I1)**
  - What information affects driver behavior and how do we deliver it through technology to improve that behavior (Applications)?
  - How can innovations in testing and measurement can help NDOT divisions (materials, safety, etc.) to come up with faster and less expensive practices?
  - How can GIS Technologies be used to improve operations within NDOT?
  - What is the benefit and cost of solar roadways to generate power?
- **Planning and Operations (I2)**
  - How can NDOT change their cultural mindset to manage risk versus multi-gaining risk?
  - What planning tools are available for implementing real costs and incorporating all disciplines?

SUMMARY OF TOP PRIORITY RESEARCH AREA QUESTIONS

- What strategies can we use for demand management strategies?
- How to incorporate sustainability considerations within NDOT's current practices?
- What innovative strategies are most effective in reducing travel demand by enhancing choices?
- How can we plan for the mobility of humans and goods instead of just vehicles?

- **Materials and Assets(I3)**
  - How do we research the cost benefits of using cold millings in "rap" instead of as shouldering material?
  - How to achieve timely and efficient inspection of infrastructures such as bridges?
  - How do we develop materials within concrete that can create low levels of power that could be used to create illumination or light signage?
  - How can roadway materials be used to remove pollutants from the air?
- **Funding and Economics (I4)**
  - Are economic development factors being taken into consideration and how should they be used for project prioritization?
  - Are the estimated economic benefits accounted for at the end of the project?
  - Are there more innovative ways to fund projects?
  - Should we develop other ways to fund innovate projects?
- **Organizational and Internal Processes (I5)**
  - How do we better research the results of our systems and there reliability and accuracy?
  - How do you measure the various project delivery methods' performance?
  - How to select best project delivery methods for fostering innovation in planning, design, and implementation of projects?
  - How to best streamline the research procurement/proposal process to support NDOT's needs?
  - Are there ways to reduce fear of chance and innovation?
  - What strategies could NDOT utilize to improve internal departmental processes or external project management activities?
  - How can the DOT better insure consistency between districts and Head Quarters?

Be the employer of choice

- **Employee Retention (E1)**
  - What are the most effective strategies to attract, select, and retain qualified employees?
  - How is retention related to being competitive with other public agencies?
  - How do we better retain NDOT's current EEs through keeping them engaged and challenged?
  - Can we retain the expertise in house as oppose to contracting out for expertise?
  - How do we retain and provide a career track for these key people?
- **Hiring (E2)**
  - How do we better reach out to our applicant pool especially to minorities and women?
  - How do we promote the best features of NDOT and Nevada?
  - What is the performance of the summer intern program at attracting people to NDOT?
  - How do we get the right person in the right position?
  - What are the key positions of our agency and what are the required skill sets for those positions?
  - How do we attract and recruit qualified staff for our positions?
- **Employee Training (E3)**
  - What skills are necessary from employees and what tools, training, and resources need to be provided to those employees to develop an excellent workforce that provides quality service?

SUMMARY OF TOP PRIORITY RESEARCH AREA QUESTIONS

- How do we educate and train these EE's in house so we don't lose them?
- What kind of training should be provided to NDOT employees?
- What methods can NDOT management use to educate the employees?
- How can NDOT management reduce the damages to its properties by non-skillful employees?
- How do we train and motivate staff to maintain their effectiveness?
- How do we educate and train qualified staff for our positions?
- When does an apprenticeship program make sense and how do we do this?
- How do we provide employees with challenging work?

- **Compensation Package (E4)**
  - Is there other DOT's that reward employees with performance based bonuses and how would this be implemented at NDOT?
  - What is a competitive compensation policy for similar government/private positions and how does NDOT become competitive?
  - What does team building and employee incentive programs make sense and how do we do this?
- **Work Environment (E5)**
  - What are the most effective ways to improve communication between NDOT management and employees?
  - How do we get better cooperation/coordination between political and administrative?
  - How effective and cost effective would a work from home program be? Partial or full time?
  - What are the things that people really care about?
  - How do we overcome barriers in policy and state law?
  - What should we look like as a transportation agency and how does that compare with what we are?
  - How do we compare with other similar agencies?
  - What are effective strategies to boost employee loyalty?

Deliver timely and beneficial projects and programs

- **Project/Program Prioritization and Selection (P1)**
  - How can we effectively select projects based on a regional and statewide level analysis?
  - How to synchronize structures, materials, traffic, and construction as integrated components for decision making?
  - How do the "matrix management" principles work in the delivery of projects compared to the traditional management method?
  - How do we better evaluate and prioritize projects to meet regional and statewide needs and meet the transparency needs of our customers?
  - How can we prioritize projects for both the long-term and short-term benefits and what balance is needed with this type of prioritization?
  - How do we anticipate and account for future needs?
- **Project/Program Evaluation and Effectiveness (P2)**
  - How can we establish and meet the purpose, need, and quality level of the project throughout the project development process?
  - How do we follow-up with stakeholders to determine if the goals of the project were met?
  - What method is the most effective for the future: retaining knowledge in-house or externally?
  - How do you measure the strategic goals of the project?
  - How will NDOT comply with Map-21 requirements for performance measures?
  - How do you measure "timely and beneficial projects and programs"?

SUMMARY OF TOP PRIORITY RESEARCH AREA QUESTIONS

- How do we as an agency focus on getting the job done rather than me as an employee making my job easier by doing my job most effectively?
- When is flexibility appropriate to get the job done?
- What is the good and the bad of doing projects in phases?
- How do we develop programs for trial projects that may not run through the regular proposal system?

- **Project/Program Cost and Benefit (P3)**
  - How can we get the best value from capital dollars and provide proof of that value?
  - What ways are there to get funds not related to federal grants?
  - How to evaluate "super project" funding prioritization on the general conditions of the rest of the system (decline in IRI)?
  - How can we develop a better and more reliable long range plan that still takes into consideration benefit-cost to the public?
  - What is the most cost effective process for projects: in-house or contractor/consultant?
  - What are the cost and schedule performance measures of constructed projects?
- **Project/Program Data (P4)**
  - How is the overall relevance and usability of the data?
  - Will the data be useful in the timeframe that is relevant to the process of recognition/reaction by the agency?
  - Can the data be applied before the useful life of the data is reached?
  - How can cost and schedule data of constructed projects be used to develop effective strategies for delivering timely and beneficial projects and programs?

Effectively preserve and manage our assets

- **Asset Management (A1)**
  - How can we plan, budget, and implement efficient maintenance and operations of what we build?
  - How can we improve inventory of assets and information?
  - How to optimize decision making regarding seismic rehabilitation that integrates structural safety, life cycle cost, constructability, and impact on traffic?
  - How do we better manage our assets through life-cycle evaluation?
  - What activities does NDOT do best and what should we contract out?
  - How can we better use GIS systems to manage our assets?
  - How can we better communicate all information?
  - How to determine the latest and better lighting technology?
  - What sign materials should be used so that lights aren't required?
  - How can we use technology to improve asset management?
  - What does an effective asset management program look like?
  - What resources are required to meet our published goals?
  - What are the implications of not providing additional resources to meet our published goals?
  - What innovative and outside of the box ways can we look at to reduce traffic volumes on our roadways?
  - How can we increase system resilience by improving earthquake performance and post-earthquake recovery?
- **Asset Preservation (A2)**
  - What are the effects of decreasing maximum allowable esals?
  - How is the effectiveness of various asphalt blends for preservation and chip seal?
  - What are the differences between contractor and NDOT placed overlays?

SUMMARY OF TOP PRIORITY RESEARCH AREA QUESTIONS

- How can we effectively use the new and emerging technologies to assess the conditions of assets?
- How to optimize repair and rehabilitation strategies of assets?
- Is there an optimal maintenance strategy for a given asset and if there is, is it worth the cost?
- Why do pavement marking last less time here than in other places?
- How long will signs last in this environment?
- What is the relationship between capacity and pavement preservation?
- How do we develop more durable materials?
- What new materials can be used to help reduce cracking and thermal expansion?

- **Cost and Funding (A3)**
  - How much does it actually cost to maintain our assets?
  - How do we demonstrate the effects of various funding allocations on the transportation system network?
  - How do we best use our limited resource ($) and state forces versus contracting out?
  - How do we attract private money?
  - How can the maintenance be done cost effectively with life-cycle reliability?
  - How the various construction methods can impact the life-cycle cost and reliability of the assets?
  - How can we assess the benefits and costs of recycling?
  - What is the benefit/cost of a global system management program?
  - How can we improve our understanding of environmental impact of assets in the lifecycle cost analysis?
  - How can we better prepare for and measure lifecycle costs in asset decisions?

Effectively operate the transportation system

- **Data Management (O1)**
  - How can we improve/enhance data collection, synthesis, and use across modes?
  - Are there opportunities to collect and use more data from the arterials to operate them better?
- **Maintenance and Operations (O2)**
  - How can we manage incidents to reduce effects on traffic and improve system reliability?
  - What are the best uses for ITS?
  - How can we improve freight movement and economic vitality?
  - How can we improve truck parking?
  - How to determine what information to provide to highway users?
  - What resources do we need to effectively operate the transportation system and how do we get those resources properly allocated?
  - How do we take advantage of modern technologies to improve maintenance efforts such as snow and ice mitigation?
  - How do we plan for the raising baby boomer generation?
- **Integration of all Modes of Transportation (O3)**
  - How can we get people to step out of their vehicle and using alternative modes?
  - Do roadways work better with BRT in place?
  - How can we collect better data and more accurate data on all modes?
- **System Optimization (O4)**
  - How do we sell the DOT's needs to politicians?
  - What methods/innovations can be used to optimize movement during the construction/repair on the roadway?
  - What is the most effective ways to optimize movement and mobility through corridors?

SUMMARY OF TOP PRIORITY RESEARCH AREA QUESTIONS

- What is the effectiveness of existing systems?
- What instrumentation is available to improve predicting truck loads, traffic volumes, and decision making for both planners and real time users?

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