**Utah’s Innovative Program**

As the state transportation agency that customized weather information for its benefit, UDOT exemplifies how automation assists DOT operations, maintenance, and construction functions by providing detailed, area-specific weather forecasts. This nationally unique program, which manages 48 RWIS stations and excess of 10:1, and feedback from maintenance managers and construction engineers, as well as a benefit-cost analysis focused on winter maintenance costs, the evaluation indicated that the benefit-cost ratio associated with UDOT’s weather operations program is in excess of 10:1, and feedback from maintenance managers and construction engineers, as well as a benefit-cost analysis focused on winter maintenance costs, the evaluation indicated that the benefit-cost ratio associated with UDOT’s weather operations program is in excess of 10:1.

**Methodology**

A survey of UDOT personnel in maintenance and construction was developed and conducted in the first few months of the project. The respondents answered the following questions:

- Use of weather forecasting how weather information is utilized, from what sources, and whether it is cost-effective.
- Awareness of the UDOT Weather Operations/RWIS Program.
- Experience with using UDOT weather services, including satisfaction, efficiency, recommended improvements, and how the program may have altered their practices.
- For service in winter maintenance, all the UDOT maintenance engineers, area supervisors, and crew supervisors were contracted. For service in user construction, all the UDOT resident engineers and a few contractors were contracted. The survey responses were followed up with phone interviews.

A composite survey methodology was combined with objective data from each maintenance shed, including winter maintenance labor and material costs (L&M), adverse weather conditions, improved, adjusted vehicle miles of travel, and the average payment condition reported by vehicle operators. A composite data set was formed, including these objective data along with survey responses, which were also the survey responses of the program by various maintenance sheds, that perception of the program’s quality, and whether or not a particular maintenance shed was using the program for all the winter maintenance personnel.

Service surveys were used in conjunction with ANN modeling to identify six principal maintenance personnel beyond what is provided through other weather service providers.

**Results & Discussions**

Nearly 80 percent of the maintenance personnel respondents reported changing their approach to winter maintenance practices. Respondents indicated that they were repeatedly increasing their usage of the forecasts when a winter storm is approaching, as shown in the charts on the left. Improved forecast accuracy supports anti-icing practice, which is being increasingly used in Utah, as well as general preparedness.

- 85 percent said that UDOT’s forecasts were more usable than other weather information services.
- 76 percent said that UDOT was more cost-effective than other weather information services.
- 57 percent said that UDOT was cheaper than other weather information services.
- 21 percent said that UDOT was more reliable than other weather information services.
- 14 percent said that UDOT was more efficient than other weather information services.

**Benefits & Information provided by the program to maintenance workers**

- Approximately 80 percent of the UDOT maintenance personnel respondents reported changing their approach to winter maintenance practices. Respondents indicated that they were repeatedly increasing their usage of the forecasts when a winter storm is approaching, as shown in the charts on the left. Improved forecast accuracy supports anti-icing practice, which is being increasingly used in Utah, as well as general preparedness.

**Conclusion**

The weather project highlighted the benefits of using customized weather information to improve winter maintenance operations. The research team employed surveys of maintenance personnel, in conjunction with winter maintenance labor and material costs, to quantify the benefits associated with UDOT’s innovative Weather Operations/RWIS Program.

- Using an ANN model, marginal costs were estimated for three different weather information services.
- Using the least effective weather service provider.
- Using the UDOT weather program.
- Using the UDOT weather program.

Because of model uncertainty, ranges of cost effects were estimated. Survey questions asked the following:

- UDOT has realized significant cost savings. These savings exceed its annual funding ($15 million per year) by its use of the UDOT system.
- UDOT’s Weather Operations Program has helped to reduce labor and maintenance costs by an additional $14 to $51 million per year.
- There is potential for greater cost savings up to $80 to $12 million per year in the future, based on the success of the Weather Operations Program.

With an estimated savings in labor and maintenance costs of $2.2 million per year for snow and ice control activities, the benefit-cost ratio of the program is in excess of 10:1.

This ratio is based on the program’s added value to UDOT user groups other than winter maintenance personnel.

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