3.6 **DECISION SUPPORT SYSTEMS AS A BRIDGE BETWEEN METEOROLOGY AND SURFACE TRANSPORTATION MAINTENANCE OPERATIONS**

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1. INTRODUCTION

Beginning in the late 1950s (Turban and Aronson, 2001), the theoretical concepts of decision support systems were introduced in management science. Since this time the role of decision support systems has continually grown, predominantly in information science and business management. With a growing awareness of the role decision support systems can play within both meteorology and transportation maintenance operations, a movement has developed to establish sophisticated decision support systems in these disciplines to improve operational decision making.

2. NEED FOR IMPROVED DECISION MAKING METHODS FOR SURFACE TRANSPORATION

A primary role of surface transportation maintenance is to ensure the safety and efficient operation of the nation’s arterial and secondary road system. Although from a state's budgetary consideration it may appear that efficiency e.g., reducing operational expenses, is the primary consideration, the safety of the road system has been receiving a major emphasis over the past decade. Achieving both goals often requires challenging decision-making. Methods of improving this decision-making process must involve a broad spectrum of individuals including state Departments of Transportation (DOT) personnel at all levels, other state agencies and private sector service providers.

To organize a coordinated national effort to search for improved maintenance decision-making, the Weather and Winter Mobility Program of the Office of Transportation Operations, Federal Highway Administration (FHWA), convened the first of several meetings to identify the requirements of a surface transportation weather decision support system. Participation in these meetings included most of the state DOT's involved in winter maintenance operations. The result of these meetings has led to an active effort within the federal laboratories to develop a prototype of a Maintenance Decision Support System (MDSS).

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3. SURFACE TRANSPORTATION METEOROLOGICAL DECISION SUPPORT SYSTEMS

Decision support systems to support surface transportation weather forecasting, to a certain extent, are implicit to the forecasting process. Given the necessity to apply weather parameters to a roadway environment requires a logical decision-making process in order to effectively complete the forecasting process. A simple example of this can be seen in the decision-making process in a forecast environment for pavement frost. In order for a forecaster to predict the presence of frost on the pavement, it is necessary not only to know the present and forecast dew-point temperature of the air immediately adjacent to the pavement, but also necessary to know the present and future temperature of the pavement. Flow diagrams can be constructed that provide a logical relationship to forecasted dew point temperatures and pavement temperatures resulting in conclusions as to when frost should be expected to be present. As other factors are considered e.g., solar radiation, time of day, windspeed, the flow diagrams may be changed to reflect the increased sophistication required in the decision-making process.

4. RELATIONSHIP BETWEEN DECISION SUPPORT SYSTEMS

It is clear that many of the maintenance operations’ decisions involve weather related elements. The adaptation of present decision support methods found in surface transportation meteorology and other areas of operational weather forecasting are immediately applicable to maintenance operations. However, the final decisions made by maintenance personnel involve many additional factors that may or may not involve an awareness of weather conditions. For example, while the decision to pretreat a road surface may be governed by weather conditions, the method employed is often dictated by local regulations or economics. Therefore, the construction of a maintenance decision support system will be comprised of layers of decision, each of which may or may not interface significantly with the other layers.

5. DIVERSITY IN MDSS

Compounding the issue of MDSS deployment is the degree to which MDSS systems can be standardized. A critical issue controlling the success in adoption of MDSS within state DOT maintenance operations will be the local acceptance of these systems. Given the wide variety in practices used within a state DOT, it will be difficult for developers of a MDSS to incorporate every practice. As a consequence there is a risk at the local level that users will not adopt the MDSS without higher management mandates. For this reason, it is expected that a "go slow" approach will have to be employed to foster a successful implementation of a MDSS. Furthermore, given this diversity in methods it will be important to establish good communications throughout the state DOT maintenance division to promote the exchange of ideas and to encourage modernization of methods. Through comprehensive planning that includes the eventual integration of a MDSS into a system wide decision-making process, long-term successful deployment will be possible.

6. SUMMARY

This paper presents a perspective of the role of decision support systems within a meteorological and a surface transportation winter maintenance operations environment and the similarities and differences between these systems. The potential linkage between these decision support systems will be important as the establishment of MDSS methods occur. An effective maintenance decision support system in a rural state will require significant communications to ensure participation and incorporation of local methods.

7. REFERENCES

Turban, E., J. E. Aronson, 2001: **Decision Support Systems and Intelligent Systems**, Prentice Hall, pp. 867.