Pavement Preservation Training Development

tech transfer summary

> The aim of this research project was to develop a structured learning management system (LMS) for pavement preservation efforts using the Iowa Department of Transportation (DOT) as a case study.

Problem Statement

Extensive amounts of literature on pavement preservation exist, but a structured approach on how to train staff in selecting, designing, and applying pavement preservation techniques is lacking. Many agencies and institutes conduct occasional training on pavement preservation, but there are limited examples and many are relatively unstructured.

Therefore, information about training for pavement preservation is scarce and no research has been conducted to find appropriate methods to develop pavement preservation training.

Research Objective

The research objective was to develop a learning management system (LMS) that addresses training for pavement preservation treatments as they are dealt with during the phases of selection, design, and construction. Although pavement preservation includes many different treatments, the project focused on chip sealing or seal coating, fog sealing, slurry systems, and crack sealing and filling.
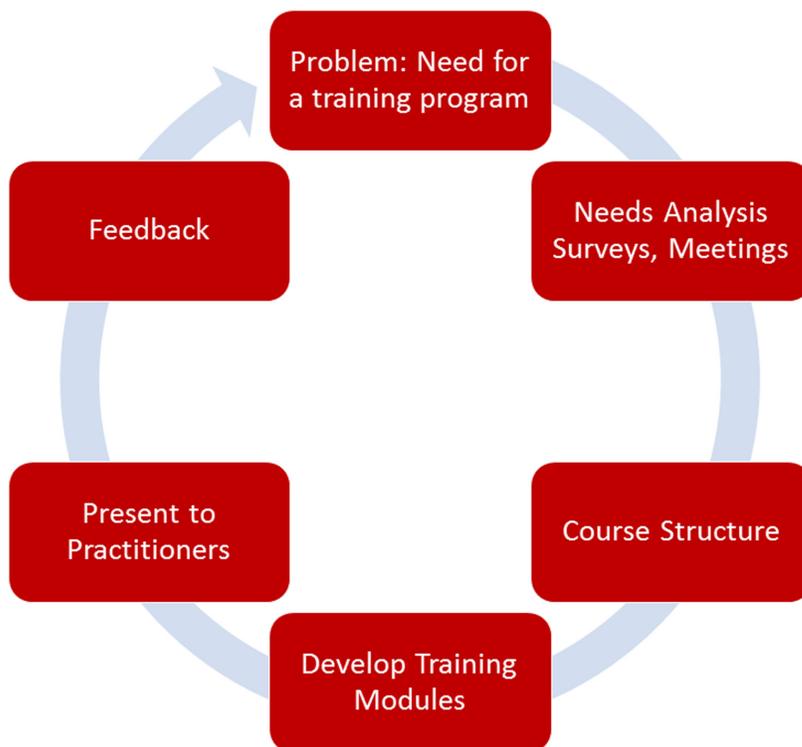

Figure 1. Research methodology

Methodology Summary

The methodology used in this research followed a combination of action research methods along with a job training structure. The job training structure allows for the development of a training program in a quick and effective manner taking into account the current knowledge and experience level of the trainees (Nolan 1996).

The action research method allows for the continuous development of a process and improvement of results (Azhar 2010). Figure 1 represents the combination of both methods as it applies to this research project.

The first cycle started by identifying/diagnosing the problem. Then, through means of questionnaires and meetings, data were gathered regarding the level of knowledge that prospective trainees have on pavement preservation in each of its phases.

Data were analyzed to determine areas that needed to be strengthened. With the data analyzed, it was important to create a course structure that would satisfy the needs, responsibilities, and schedules of the trainees.

With a structured course, several training modules were developed for each treatment in each of its phases. To validate the modules, the developed presentations were presented to practitioners. Practitioners provided the research team with feedback regarding areas of improvement and possible changes to the presentations, which in turn ended the first cycle.

The second cycle consisted of improving the presentations developed previously given the data that were gathered and with the feedback received. The course could be restructured, if necessary, in case the feedback led to this conclusion. However, this was not the case on this project.

With the feedback received, most of the updates and changes came in the training module development phase. After the modules were adjusted according to the feedback received, they were presented for final implementation and further feedback.

The development of the needs analysis questionnaires was critical for determining how the training presentations would take shape. When developing the needs analysis questionnaires, the research team analyzed the literature on pavement preservation and each treatment and structured the statements and questions around the most relevant information.

Subjects repeated consistently in various sources were considered most relevant and, therefore, were included in the questionnaires. In addition, professionals with knowledge in the field provided their input on the questionnaires before they were actually distributed.

The questionnaire results were analyzed and the presentation content was adjusted to address areas in need of more attention properly.

Key Findings

The questionnaires were an effective way to help determine which type of information should be emphasized in the modules, but it was found that the questionnaires should not be the only means of obtaining information.

The project team found the face-to-face round table discussions to be very beneficial not only for obtaining information, but also for validating material in progress. It was determined that when doing qualitative research such as this, the best information can sometimes be obtained via informal round table discussions. (However, this can be more difficult to document and prove that it is useful without quantitative data.)

The research showed it is important to train each division staff (maintenance, design, and construction) separately, as each staff division has its own needs and interests. It was also preferred that each treatment was covered on an individual basis.

The construction staff operates differently than the concepting or design staff, so an annual face-to-face meeting may not be feasible with them. Because of this, it was determined that the construction modules would be pre-recorded and made available online for quick reference.

Hence, the training method used for each staff division also varied. For example, the construction division benefited most from an on-demand short video that they can watch right before application, while maintenance staff benefited more from a longer face-to-face session where they can share opinions and experiences.

The LMS that was developed allows for structured access to the desired training. For example, an employee interested in the design of chip seals or seal coats can have direct access to a training module prepared specifically for the design of chip seals.

Finally, the methodology used for this project fit the framework of qualitative research very well. The fusing of the job training structure and action research gave the project team the ability to develop a sophisticated training structure effectively while still having the ability to validate the material in a cyclical process.

Implementation Readiness

The training modules developed target the gap from the results of the needs analysis. The concepting (selection) training focuses on providing the tools necessary to help make proper treatment selection. The design training focuses on providing the information necessary on the treatment materials (mostly binders and aggregates) and how to make proper material selection. The construction training focuses on providing equipment calibration procedures, inspection responsibilities, and images of poor and best practices.

The concepting and design training modules were prepared to be used in face-to-face training where attendees can share their experiences, although the modules can also be used as online references. To implement this method, an individual is needed to organize and run an annual meeting with each staff division. The module slides will be made available to the Iowa DOT so information can be revised and the modules can be made available after that.

The construction training modules were prepared to be conducted online (and on demand) in a short time slot, allowing trainees to prepare for construction only days or hours prior to application. These training slides will also be made available for editing and changes can be made as needed. The resulting sets of slides or modules will be uploaded to a specific location on the Iowa DOT website for reference throughout the year.

The LMS developed still needs to be implemented for use by the Iowa DOT to ensure it achieves the intended objective successfully. The LMS that was developed contains the information and tools to educate Iowa DOT staff, but there needs to be an initiative to implement the system fully and to start to make a change. Otherwise, the LMS will not be effective.

As a result of the research, it is recommended to evaluate the performance of pavement preservation treatments pre- and post-training continuously to compare results and verify the effectiveness of the LMS.

Implementation Benefits

The findings from this project will help developers devise training programs for professionals on the proper selection, design, and application of pavement preservation treatments for the purpose of keeping roads at high levels of performance.

Highways and roadway agency staff from various divisions will benefit from the findings and results of this research. The staff divisions involved are maintenance staff (who select the road and treatment to be applied), design staff, and construction staff.

One of the positives of the resulting material is that it can be modified and streamlined for use in the coming years. This LMS provides a framework for the Iowa DOT to work with to help promote a more successful pavement preservation program.

In addition, a telephone survey of other state agencies was conducted and the feedback was positive on the use and practicality of the developed LMS. These results indicate that the research conducted is not only useful for the Iowa DOT, but that the process can be used by other agencies to help implement more effective pavement preservation programs.

References

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